SHORELINE RESTORATION PLAN

For Lewis County and

The Cities of Centralia, Morton and Winlock

Prepared by:
Lewis County Community Development

Ecology Grant # G1200468




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LIMITATIONS

As with any report, there are limitations (inherent or otherwise) that must be acknowledged. This report is limited with regard to the subjects covered, materials reviewed, and data available at the time the report was prepared. The authors and reviewers have made a sincere attempt to provide accurate and thorough information using the most current and complete information available and their own best professional judgment. If you have questions regarding the content of this report, please contact staff at Lewis County Community Development department.

PURPOSE AND INTENT

This restoration plan is intended to serve as a guide for Lewis County and the cities of Centralia, Morton and Winlock (collectively referred to as the Coalition) to improve ecological functions of shoreline areas as required by WAC 173-26-201(2)(f). The plan describes general goals, current restoration projects at site-specific locations, and additional potential restoration opportunities not yet in the planning process.

The purpose of this restoration plan is to identify degraded areas and impaired ecological functioning in the shoreline environment within Coalition jurisdictions and identify projects, programs and partners that could help to restore the shoreline functions.

The document is intended to be a planning-level framework that:

- Describes an overarching vision for restoration efforts.
- Summarizes shoreline restoration goals and objectives.
- Identifies waterbodies, shorelands and watersheds that are high priorities for preservation and restoration.
- Describes specific restoration opportunities and recommends actions to implement the projects.
- Identifies potential partners and methods to integrate this plan with their efforts.

Where projects are proposed on public or private land, the projects represent voluntary actions, and in no way are intended to require the restoration of the property. No projects will occur on private property or lands owned by other agencies without the willing cooperation and participation of the affected landowner.

Restoration

Restoration as used within this plan means the re-establishment or repair of degraded areas in a way that enhances ecological function and structure beyond existing baseline conditions. As stated within the definitions for the Shoreline Master Program, restoration is defined as:

> *The reestablishment or upgrading of impaired ecological shoreline processes or functions. This may be accomplished through measures including but not limited to re-vegetation, removal of intrusive shoreline structures and removal or treatment of toxic materials. Restoration does not imply a requirement for returning the shoreline area to aboriginal or pre-European settlement conditions. (WAC 173-26-020).*

Protection vs. Restoration

This focus on improving degraded functions differs from the protection or preservation of natural lands. While restoration identifies lands that have been degraded by factors such as constrained floodways, minimal riparian vegetation, or an overabundance of sediment, protection is largely focused on preserving areas of high quality ecological functions. Within the context of the Shoreline Master

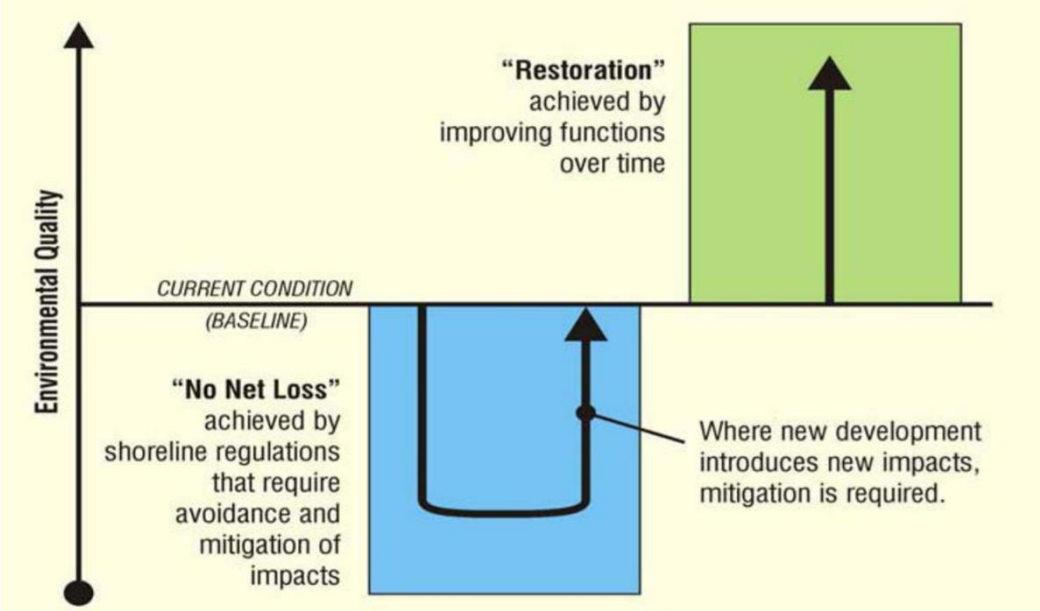
Program, the protection or preservation of ecological functions is typically achieved through the implementation of standards within the Shoreline Master Program (including the Shoreline Environmental Designations, shoreline buffers, and use requirements). Restoration on the other hand typically involves physical projects (such as decommissioning a road, installing new culverts or re-establishing side channel habitat) that physically improve the performance of an ecosystem.

Restoration vs. Mitigation

Restoration also differs from mitigation. Mitigation typically addresses the impacts associated with a particular project to help return an environment to the baseline present at the time of the application (see Figure 1). As defined by WAC 197-11-768, mitigation is the sequential process of avoiding, minimizing, rectifying and reducing impacts associated with a project, as well as monitoring and compensating for unavoidable impacts.

Within the Shoreline Master Program, mitigation is a regulatory requirement, whereas restoration, as addressed in this plan, is voluntary and intended to improve ecological functions above existing conditions.

Figure 1: The Concepts of Mitigation and Restoration in the Shoreline Management Act



Partnership

Multiple strategies including physical restoration, educational outreach, and acquisition of shoreline properties to enhance shoreline functions and resources are proposed as part of this plan. Ultimately, the success of these efforts, depends on the partnership of a number of government and nonprofit organizations including, for example, Lewis County Conservation District, the Cowlitz and Chehalis Indian Tribes, the Washington Department of Natural Resources (DNR), the Washington Department of Fish and Wildlife (WDFW), the Washington Department of Ecology (Ecology), the Chehalis Basin Lead Entity for Salmon Recovery, and the Lower Columbia Fish Recovery Board.

Objectives

The following goals and policies drove the creation of this plan, and identification of possible projects.

1. Improve ecosystem processes, functions, and values over time.

    - Objective 1.1: Use principles of landscape and conservation ecology to design restoration and enhancement actions to improve shoreline ecological functions and processes.

    - Objective 1.2: Restore physical and biological ecosystem-wide processes that benefit shoreline habitat structure and functions (such as native riparian vegetation along the shoreline, the promotion of more naturalistic sediment transport processes, and the recruitment and retention of large woody debris).

    - Objective 1.3: Restore biologically and aesthetically degraded areas to the greatest extent feasible, while maintaining appropriate use of the shoreline jurisdiction.

    - Objective 1.4: Avoid adverse impacts to shoreline functions (such as deterioration in water storage capacity, the quality of fish and wildlife habitat conservation areas, and water quality) in all shoreline restoration and enhancement projects.

2. Increase the quality and availability of habitat for salmon and other sensitive and/or locally important species.

    - Objective 2.1: Target restoration and enhancement projects to support the life cycles of special status species such as Chinook, Coho, steelhead, and other anadromous fish; locally important plants, fish and wildlife; and other populations or habitats for which a prioritized restoration or recovery plan is available.

3. Integrate restoration efforts with local governmental decisions.

    - Objective 3.1: Evaluate opportunities for restoration when planning for parks, transportation or other capital facility projects.

    - Objective 3.2: Wherever feasible and practical, combine restoration efforts with other public benefit amenities, such as flood storage, park land, interpretive signage and/or public access to the shoreline.

4. Encourage and facilitate cooperative shoreline restoration and enhancement projects between local, state, and federal agencies, tribes, nonprofit organizations, public utilities, the conservation district, and landowners.

    - Objective 4.1**:** Integrate restoration and enhancement with other natural resource management efforts.

    - Objective 4.2: Identify funding sources to implement restoration, enhancement, and acquisition projects; particularly those that are identified in this restoration plan or in local watershed plans.

- Objective 4.3: Establish systems to facilitate and fund restoration. Consider expedited permit processing and the creation of tax incentive programs, mitigation banks, grants, land swaps, or other programs.
- Objective 4.4: Develop permit processing guidelines at the local jurisdictional level that will streamline the review of restoration-only projects.

IDENTIFICATION OF RESTORATION PROJECTS

Information Sources

A variety of information sources were utilized to develop this plan. Among the sources included:

- Salmonid habitat limiting factor analysis. Water Resources Inventory Area 26 (Wade 2000)
- Lower Cowlitz River and Floodplain Habitat Restoration: Project Siting and Design Final Report (Tetra Tech 2007).
- The Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan: Volume II, Chapter F. Upper Cowlitz Subbasin (LCFRB 2010a).
- The Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan: Volume II, Chapter G. Lower Cowlitz Subbasin (LCFRB 2010b).
- The Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan: Volume II, Chapter G. Toutle Subbasin (LCFRB 2010c).
- Salmonid habitat limiting factory analysis. Chehalis Basin and nearby drainages: Water Resources Inventory Areas 22 and 23 (Smith and Wenger 2001).
- Chehalis Basin Partnership: Multi-Purpose Water Storage Assessment (Tetra Tech/KCM and Triangle Associates 2003).
- The Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and 23 (Grays Harbor County 2011).
- The Chehalis River Basin Comprehensive Salmonid Enhancement Plan (Anchor QEA 2012).
- The Aquatic Species Enhancement Plan (Chehalis Basin Work Group 2014).
- Scenario of Small Flood Damage Reduction Projects (Chehalis Basin Work Group 2014).
- The Draft Shoreline Inventory and Characterization Report for Lewis County and the Cities of Centralia, Chehalis, Morton, and Winlock (Herrera, AHBL, and CORE GIS 2013).

These studies incorporated field surveys and analytical methods to determine restoration priorities and make recommendations for sites that would provide the greatest gain towards improving critical habitats and shoreline ecological functions. Summaries of their findings are provided in this plan to inform users about already documented priorities for restoration and protection, and have been used as the primary basis for planning and prioritizing future projects.

Identification of Other Restoration Opportunities

Beyond these studies, additional opportunities were also identified largely based on known ownership characteristics, and the possibility of partnerships to add public benefit amenities to existing shorelands

(such as improved habitat, improved riparian function, public access to the shoreline, or flood control). The viability of these projects is not known, and these projects are solely presented as possibilities to explore further in the future.

Overall Coalition Restoration Priorities

Lewis County is comprised of four primary watersheds: the Deschutes, the Nisqually, the Chehalis and the Cowlitz. This chapter is intended to provide a brief description of the watersheds, including known environmental concerns, and communicate some of the key restoration priorities for the areas.

Nisqually – (WRIA 11)

Overview

The Nisqually management area includes 180 square miles of land in Lewis County (Herrera, 2013). The area includes the Little Nisqually River, the Nisqually River and its southern tributary streams from the upstream end of Alder Lake (a manmade lake created by the Alder Lake Dam) to near the Nisqually River's source on the Nisqually Glacier on Mt. Rainier. Key tributaries include Berry Creek, Catt Creek, Mineral Creek, Roundtop Creek, and East Creek. A large natural lake, Mineral Lake, is also located in the within the management area.

Within the Nisqually Management Area, land cover is more than 70 percent forest, with most of the remaining 30 percent consisting of residences, agricultural uses or land disturbed within the last 50 to 100 years. Public land encompasses roughly 70 percent of the land in the area, and most of the privately held land is owned by timber companies. Concentrations of residential development are located outside of Ashford along Big Creek, near the mouth of East Creek (where it intersects with the Nisqually River), and along the southern border of Mineral Lake.

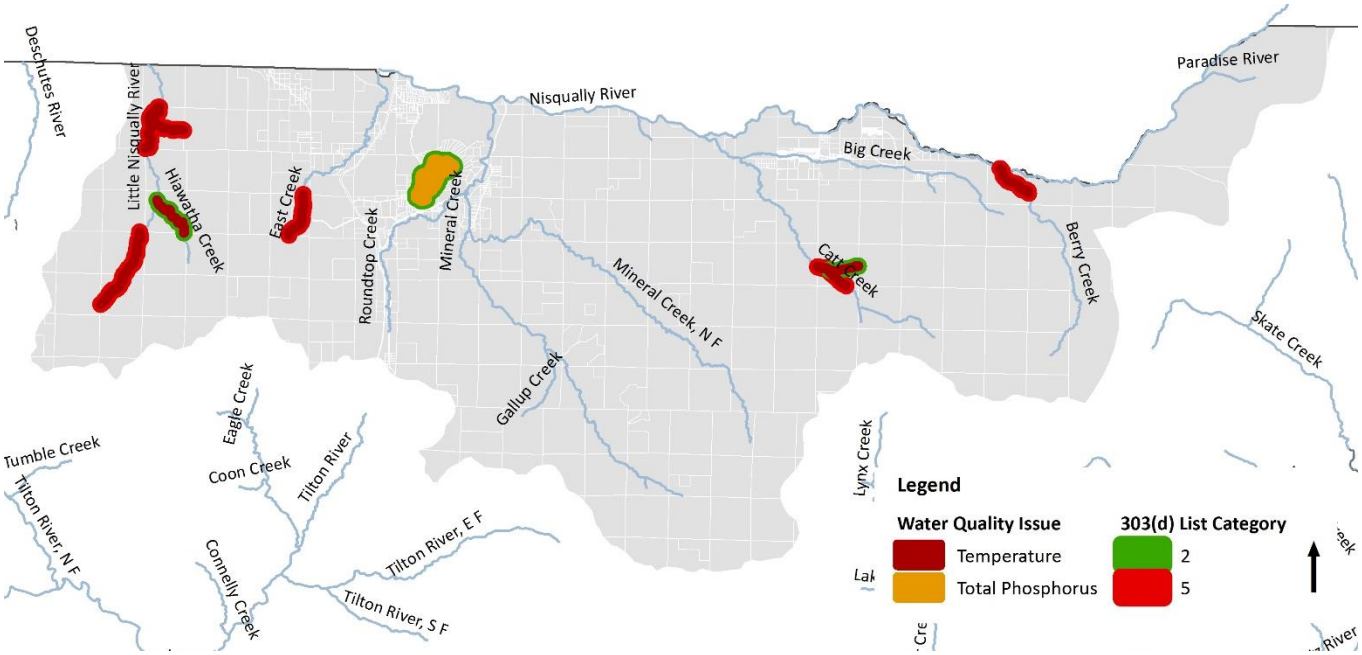
Key Issues

The Lewis County portion of the Nisqually watershed is located upstream of Alder Dam, a complete fish passage barrier, and the barrier makes the management area a low priority for fish restoration efforts. The area is identified as Tier 5 reach within the Nisqually watershed (the lowest priority for restoration) and the majority of restoration efforts in the basin are focused downstream of the dams (Nisqually Chinook Recovery Team 2013).

While the management area constitutes a low priority for salmon enhancement, several potential projects nevertheless remain possible to promote restoration in the area. Many shorelines exhibit processes and functions characteristic of historic logging operations (including channelization, scour, sedimentation, and a decrease in habitat diversity) and a variety of restoration efforts could be targeted to address those degraded functions. Within the watershed, the lowest functional reaches are characterized by development that has reduced forest cover compared to historical conditions and by areas that have current agricultural uses (such as East Creek) that have reduced riparian vegetation along the shore (Herrera, 2013). Significant areas of armoring are also present along certain portions of the Nisqually River.

Beyond these degraded functions, Mineral Lake and several stream reaches have been identified as having water quality concerns due to high temperatures or increased levels of phosphorus according to the Department of Ecology's Water Quality Assessment list (see Figure 2) (DOE 2015).

Figure 2: Nisqually Basin Water Quality Issues



This map shows water quality concerns in the Nisqually basin, based on the Washington Water Quality Assessment list (Department of Ecology 2015). The federal Clean Water Act, adopted in 1972, requires that all states restore their waters to be "fishable and swimmable," and Washington's Water Quality Assessment lists the water quality status for water bodies in the state. Category 2 - Waters of Concern are waters where there is some evidence of a water quality problem, but not enough to require the production of a water quality improvement project at this time. Category 5 waters are polluted waters that require the implementation of a water quality improvement project, such as the development of a Total Maximum Daily Load analysis – a report that calculates the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.

Restoration Priorities

Key restoration priorities within the watershed based on these items include:

Restoration of Riparian Areas – The bulk of the land within the Nisqually Management Area is included within private timberland or federal government ownership. In these areas, gradual restoration is anticipated to occur as a result of the Forests and Fish Law, which sets standards for timber harvests and thinning, road construction, and other forest practices on public and private forest land. The law is implemented by the State Forest Practices Rules, which:

- Require the preservation of riparian buffers.
- Provide standards for the establishment and enhancement of forest land roads.
- Provide guidance for the replacement of culverts.

These State Forest Practices Rules also address the federal listing of certain threatened or endangered species through the Forest Practices Habitat Conservation Plan (HCP). This HCP, developed by WDNR, is meant to ensure that landowners who conduct forest practices activities in compliance with the Forest

Practices Act and State Forest Practices Rules are compliant with the requirements of the Federal Endangered Species Act for those species.

Beyond these forest practice activities, various projects to restore riparian habitat, reduce the occurrence of elevated stream temperatures and cultivate large woody debris are also possible on private property outside of timberlands. If pursued, these restoration efforts could target areas of known temperature concerns (such as East Creek) or areas where single-family homes or agricultural lands are located adjacent to streams (such as Mineral Creek). All projects within these areas will be based on landowner willingness to participate in the effort.

Culvert Replacement – In addition to the restoration of riparian areas, the County will also work to replace priority culverts within the watershed. As noted above, many of these culverts will be replaced as a result of the State Forest Practices rules, but some will remain along County roads. Removal of these culverts, will not provide additional salmonid habitat due to access blockage as a result of the dams downstream, but will provide enhanced stream habitat for other aquatic and terrestrial species.

Mineral Lake Habitat and Access Enhancement – Beyond these basin-wide priorities, efforts could additionally seek to restore shoreline functions around Mineral Lake. Mineral Lake provides a much loved and used recreational amenity within the Nisqually Management Area, and a variety of enhancement projects including efforts to improve public access and nearshore habitat could be pursued (two potential projects to enhance nearshore habitat and public access are shown in Appendix A).

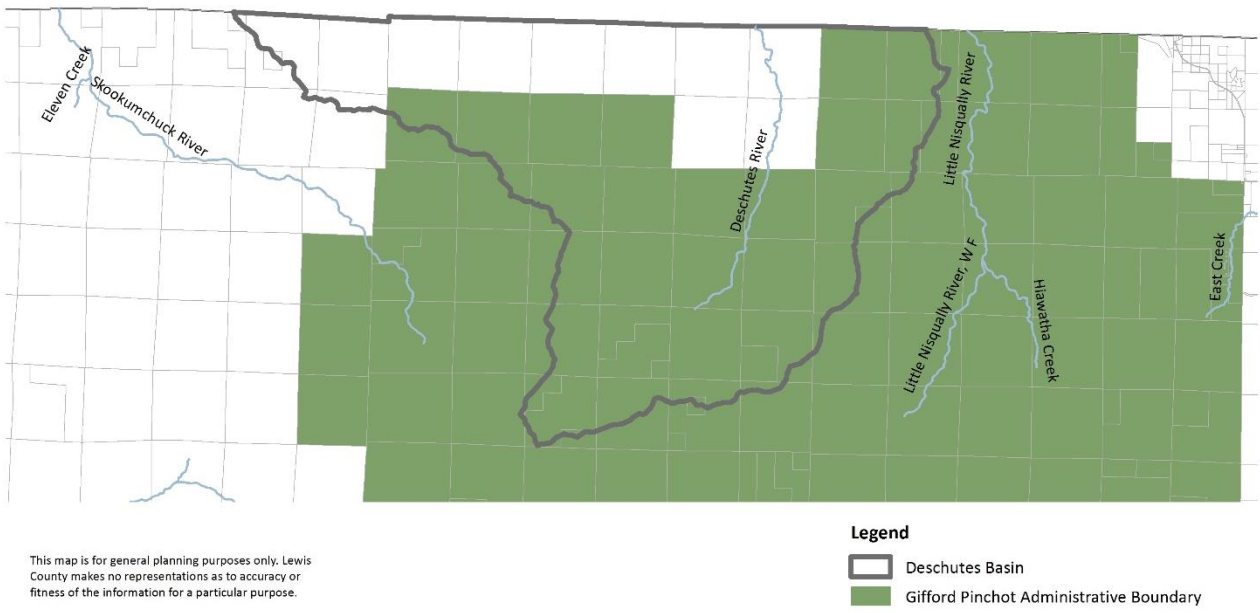
Additionally, efforts could be made to limit the effects of phosphorus on the lake. Mineral Lake is currently listed as a water body of concern for phosphorus, a typical nutrient associated with fertilizers and sewage effluent. To ensure good water quality in the lake in the future, the County could further investigate the sources contributing to the problem, and work to reduce the supply of nutrients to the water. Potential methods to address the issue include public education about the problem and the use of a variety of strategies to limit nutrients (such as working to replace failing septic systems and restoring lake buffers or wetlands to help filter the water, among a variety of other options). The most appropriate approach to address the issue will depend on the identified source of the pollution.

Deschutes – (WRIA 13)

Overview

The Deschutes management area includes 25,773 feet (4.9 miles) of riverine shoreline within the upper Deschutes River basin in north central Lewis County. The area includes the headwaters of the Deschutes River, and a number of smaller tributaries, which are not subject to the Shoreline Master Program. The bulk of the management area is located in Gifford Pinchot National Forest (and administered, though not necessarily owned, by the United States Forest Service) and areas outside of the National Forest administrative boundary are owned entirely by Weyerhaeuser (see Figure 3). Forestry comprises the majority (if not all) of the land use within the watershed, and no known residential development is present in the area.

Figure 3: Deschutes Basin in Lewis County



This map shows the Deschutes Basin in Lewis County. All of the lands that are not within the Gifford Pinchot National Forest Administrative Boundary are owned by Weyerhaeuser.

The upper Deschutes River is a Tier 1 priority for protection and restoration within the watershed, even though Deschutes Falls (on the lower Deschutes River in Thurston County) blocks anadromous fish from reaching the management area (Thurston Conservation District Lead Entity 2004). Priority actions to improve the area include:

- Implementation of the Deschutes TMDL action plan to correct impaired temperature and sediment issues.
- Restoration of riparian corridors to provide shade, stabilize streambanks and recruit large woody debris.
- Enhancement of the abundance of large woody debris to encourage pool formation and the sorting of sediments.

Restoration Priorities and Opportunities

The secluded nature of the management area and the lack of existing residential development make it unlikely that significant commercial or residential development will ever occur in the area. The bulk of future development will likely be associated with forestry.

Key strategies to improve degraded functions in the area include ensuring that shoreline buffers are preserved, as required through the State Forest Practice rules, and improving road construction and maintenance (including the replacement of undersized culverts) on forest roads. Both of these items would help to reduce sediment loads within existing rivers and streams and enhance shoreline conditions.

Improving the construction and maintenance of logging roads (and decommissioning some of the roads) would decrease the risk of stream sedimentation and help to improve the hydrologic functioning of forestlands and streams. Stream sedimentation impairs water quality through increased turbidity, and physically affects habitat through the filling of pools and the increase of fine sediment within stream beds. While these features may not be immediately important for anadromous species such as salmon, given the barrier at the Deschutes River Falls, the features would likely benefit other species that are dependent on a high quality riverine habitat.

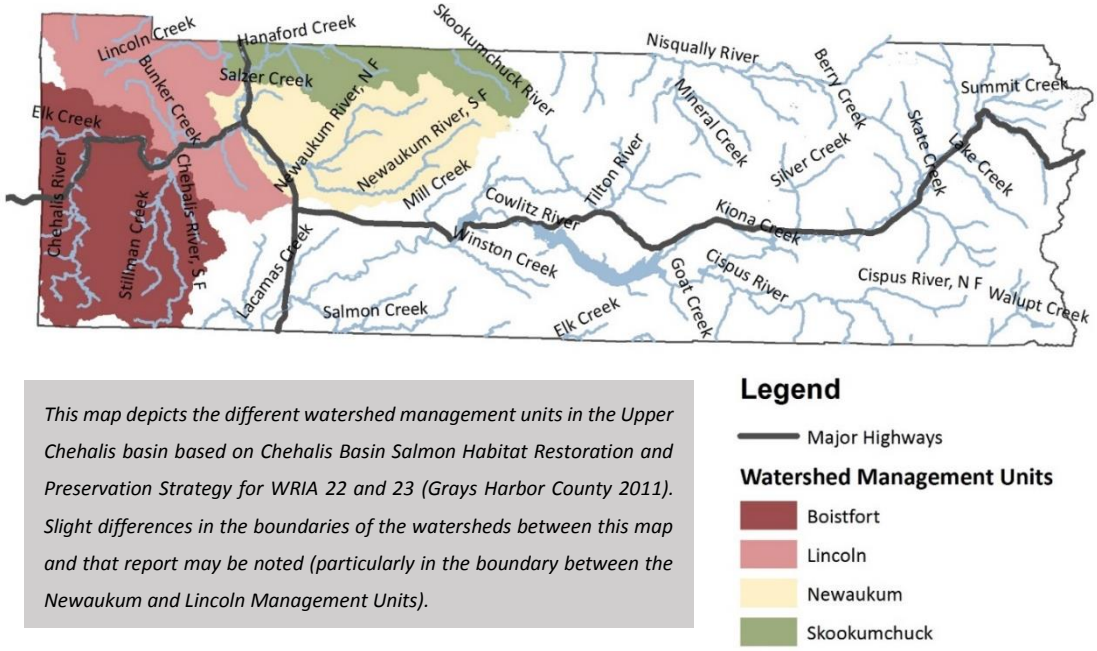
Preservation of vegetative buffers along shorelines would also enhance a variety of functions in the shoreline environment. Shoreline buffers provide a filter to slow surface and shallow groundwater flow, and ensure that woody debris is available to form future habitat features such as log jams. Riparian habitat would also contribute to shade to help address temperature issues within the watershed, and provide key features, such as downed logs and snags for amphibians and birds, as well as other aquatic and terrestrial species.

Upper Chehalis – (WRIA 23)

Overview

The Upper Chehalis basin encompasses 328.8 miles of jurisdictional riverine shoreline (and roughly 771 square miles of land) in Lewis County, and includes the City of Centralia. The Shoreline Inventory and Characterization for this Shoreline Master Program utilized five designations to classify lands in the basin: Coast Range, Willapa Hills, Puget Lowlands, Western Foothills, Cascade Lowlands (see Herrera 2013). This Restoration Plan utilizes four watershed management units (Boistfort, Lincoln, Newaukum and Skookumchuck) to better align the plan with existing watershed and flood hazard work that has been conducted for the watershed (see Figure 4).

Figure 4: Watershed Management Units in Chehalis River Basin in Lewis County



This map depicts the different watershed management units in the Upper Chehalis basin based on Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and 23 (Grays Harbor County 2011). Slight differences in the boundaries of the watersheds between this map and that report may be noted (particularly in the boundary between the Newaukum and Lincoln Management Units).

Key Issues

Key issues within the basin include flood hazard mitigation and the enhancement of aquatic habitat for anadromous fish. Numerous studies have been produced to evaluate each of these items (LCCD 2012). Documented issues include:

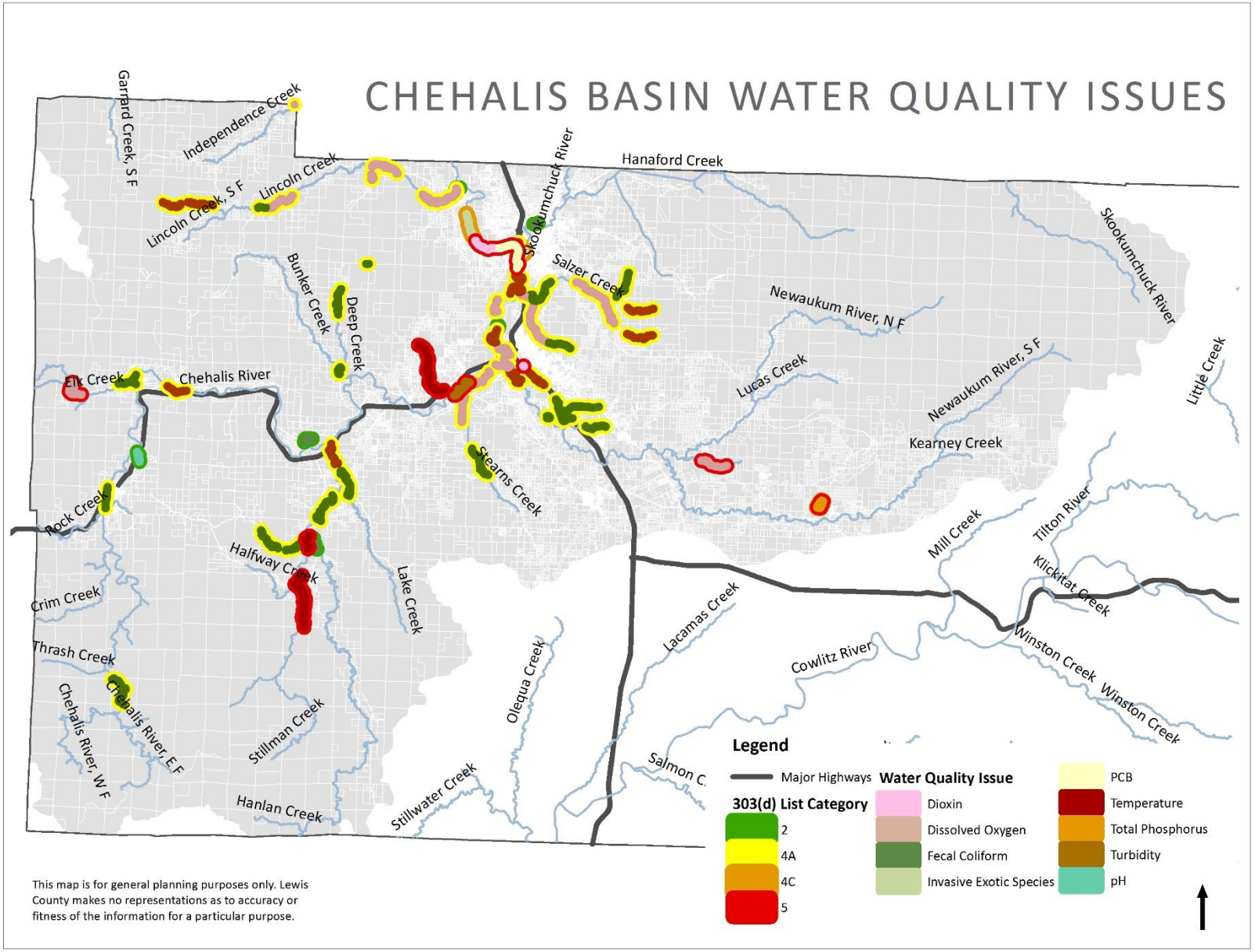
- Mass wasting and debris flows in upper portions of the basin (Smith and Wenger 2001, Grays Harbor County 2011).
- A lack of riparian vegetation in certain areas, especially in lower developed or farmed portions of the basin (Wampler 1993, Grays Harbor County 2011).
- Water quality impairments in certain water bodies (see Figure 5) (DOE 2001, DOE 2015).
- Several barriers to fish migration (Verd multiple dates, Habitat Work Schedule 2015, Lewis County 2015).
- Limited instream flows in particular streams (Grays Harbor County 2011).
- Significant flooding and impacts associated flooding in certain locations (Tetra Tech/KCM and Triangle Associates 2003, LCCD 2012, HDR, Inc. 2014).

Basin-Wide Priorities

Given the size of the basin and the complexity of the issues documented, breaking the area into smaller portions and prioritizing improvements is essential for identifying projects that most warrant the expenditure of the limited funding available. To date, existing research has classified:

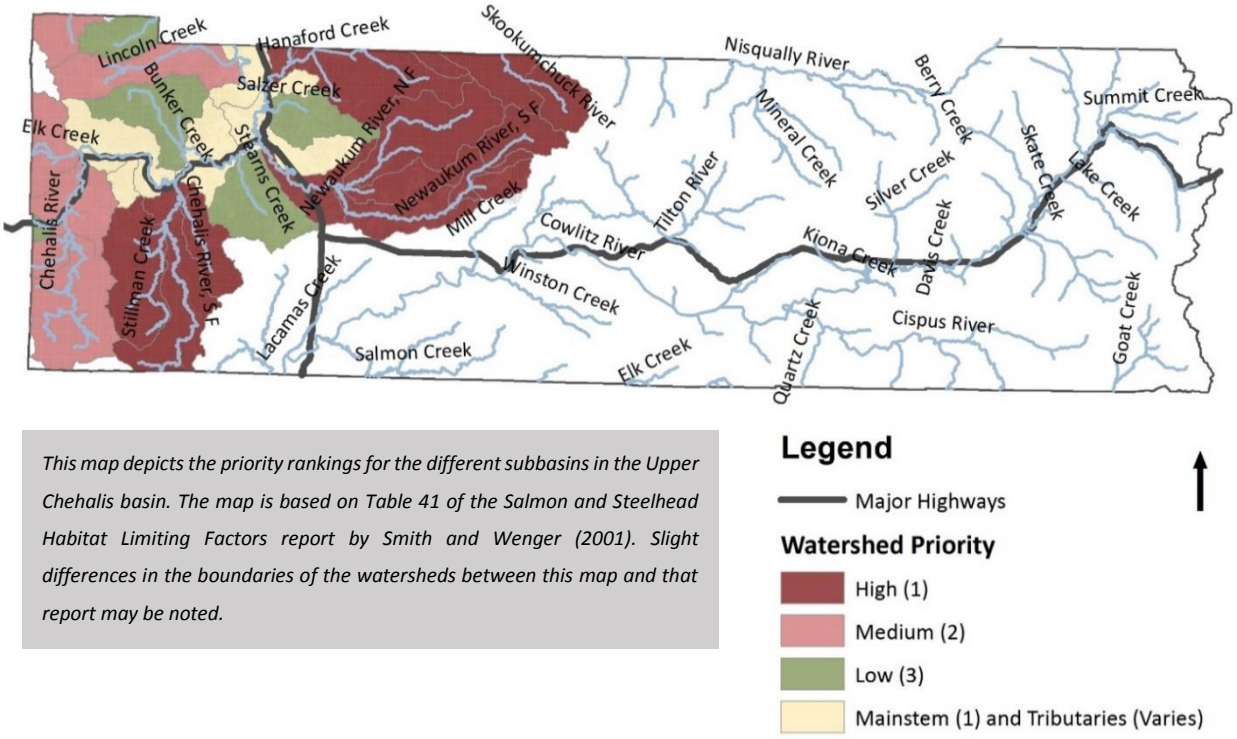
- **Priority areas for restoration activities –** High priority areas for restoration include the Skookumchuck and Newaukum subbasins, as well as the Chehalis mainstem and the South Fork of the Chehalis River (Smith and Wegner 2001) (see Figure 6).
- **Priority locations that would yield the most significant returns to anadromous fish –** Areas anticipated to yield the largest increases or restoration potential for anadromous fish include the Skookumchuck River, Newaukum River and the lower tributaries to the Chehalis (such as Independence and Garrard Creeks) (Chehalis Basin Work Group 2014, see Figure 7).
- **Priority restoration activities within each of the watersheds –** Emphasis areas in each management unit that would yield the most significant value for restoration (see Grays Harbor County 2011 or Table 1 in Anchor QEA 2012).

Figure 5: Water Quality Issues in the Chehalis Basin



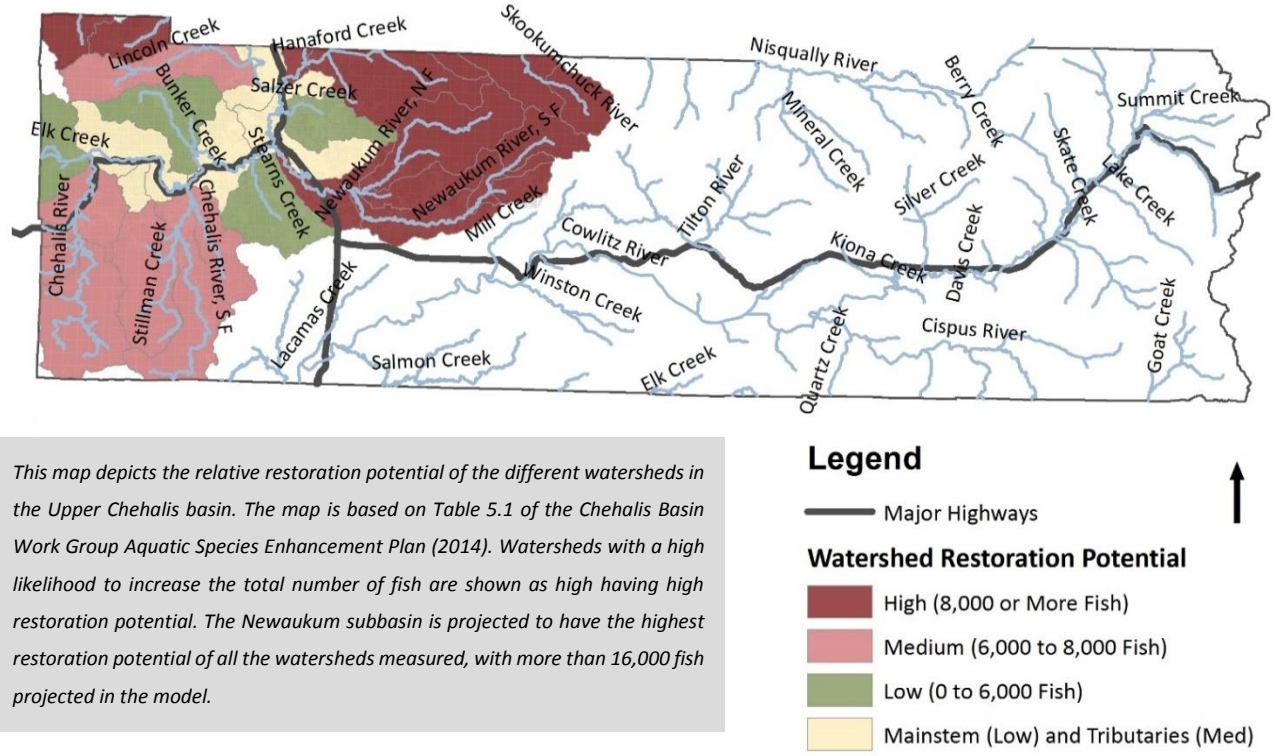
This map shows water quality concerns in the Chehalis basin, based on the Washington Water Quality Assessment List (Department of Ecology 2015). Category 2 - Waters of Concern are waters where there is some evidence of a water quality problem, but not enough to require the creation of a water quality improvement project at this time. Category 4 waters are polluted waters that have either a Total Maximum Daily Load (TMDL) analysis or other pollution prevention program in place, or are effected by a non-pollutant that cannot be addressed through a TMDL. Category 5 waters are polluted waters that require implementation of a TMDL or some other water quality improvement project.

Figure 6: Priorities for Watershed Restoration



This map depicts the priority rankings for the different subbasins in the Upper Chehalis basin. The map is based on Table 41 of the Salmon and Steelhead Habitat Limiting Factors report by Smith and Wenger (2001). Slight differences in the boundaries of the watersheds between this map and that report may be noted.

Figure 7: Priorities for Restoration for Fish



This map depicts the relative restoration potential of the different watersheds in the Upper Chehalis basin. The map is based on Table 5.1 of the Chehalis Basin Work Group Aquatic Species Enhancement Plan (2014). Watersheds with a high likelihood to increase the total number of fish are shown as high having high restoration potential. The Newaukum subbasin is projected to have the highest restoration potential of all the watersheds measured, with more than 16,000 fish projected in the model.

Based on these reports, high priority subbasins (such as the Skookumchuck and Newaukum Rivers) should be a major focus of restoration activities, especially when basin-wide habitat enhancements are sought. Subbasins in the Upper Chehalis basin (particularly the South Fork of the Chehalis) and areas such as Independence Creek and Garrard Creek subbasins are also key priorities.

Restoration Priorities and Opportunities

Beyond the priorities listed above, emphases for the basin include:

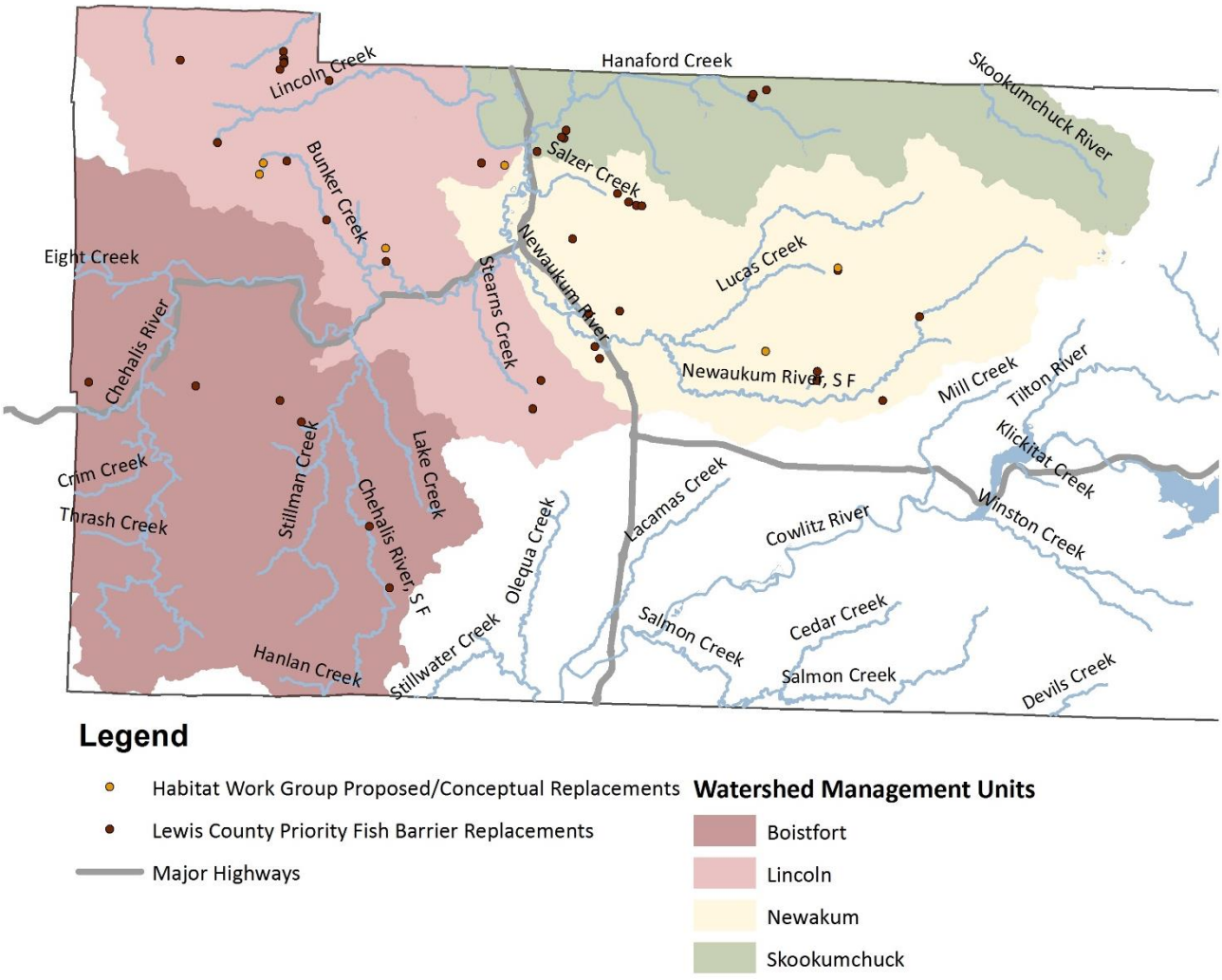
Working to Assure the Continued Implementation of the Forests and Fish Law – The Chehalis watershed contains a significant amount of timberland, and the Forest Practices rules apply to much of the property. Ensuring the continued success of this law (even though Lewis County is not responsible for the measure) will help to retain riparian vegetation including large woody debris along streams, and reduce the sediment and fish barrier impacts associated with forest roads (key priorities of both Smith and Wegner, 2001 and Grays Harbor County 2011). Over time, these measures should promote to the overall restoration of the watershed.

Enhancement of Riparian Areas – Restoration of riparian areas is also a key priority for the watershed (Smith and Wenger 2001, Grays Harbor County 2011, LCCD 2012, Chehalis Basin Work Group 2014). Riparian vegetation helps to slow runoff, provide habitat, cool water, and decrease the volume of sediment that enters streams.[1] Estimates of the cost to restore shoreline buffers have ranged between a cost of $14.2 million for 75 percent riparian buffer restoration (for several streams in the Lewis County portion of the Chehalis basin and a couple nearby tributaries outside of Lewis County), to between $40.2 million and $99.5 million for 75 percent restoration along a select group of streams (that are targeted to accommodate spawning spring-run Chinook salmon throughout the entire Chehalis basin) (LCCD 2012, Chehalis Basin Work Group 2014). Specific smaller-scale riparian and wetland habitat restoration opportunities have been identified in Wampler (1993), and the Chehalis water storage assessment (Tetra Tech/KCM and Triangle Associates 2003).

Replacement of Culverts – Enhancement of culverts has been a priority for the Chehalis watershed for several years, and a number of road crossings and culverts have been upgraded or are in the process of being replaced. Research about these culverts and the identification of replacement priorities was conducted primarily from 2002 to 2004, and was updated in 2009 (Verd, multiple dates). This research informed proposed and conceptual projects listed by the Habitat Work Group and was recently updated by Lewis County Public Works in 2015. Based on this work, priority culverts to replace in the Chehalis watershed are shown in Figure 8 and listed in Appendix B and Appendix C.

[1] Minimal riparian vegetation exists in large portions of the Chehalis watershed and several of the streams are included on the 303(d) list for temperature impacts, particularly in developed or farmed portions of the watershed (see Figure 4).

Figure 8: Priorities for Culvert Restoration



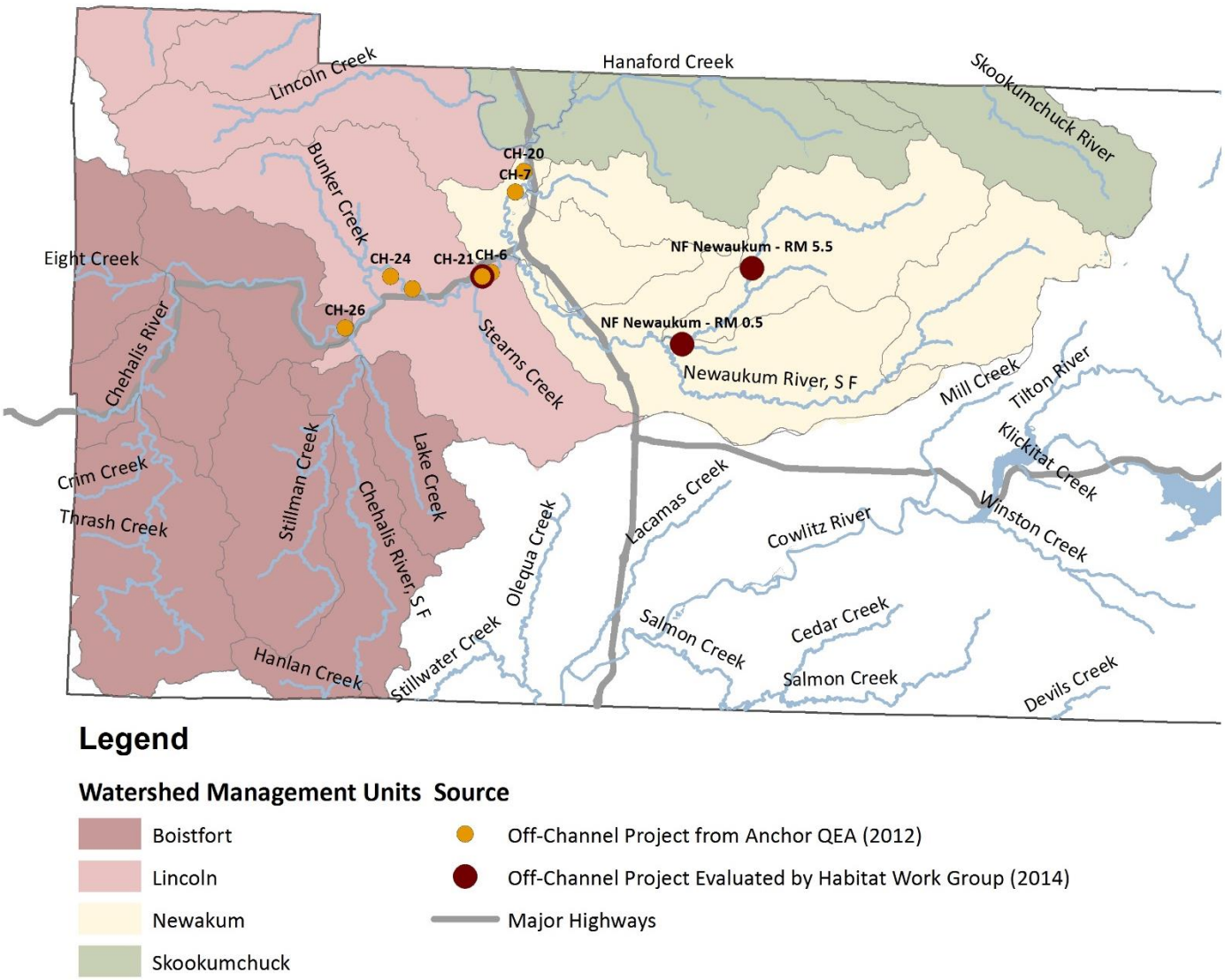
Off-Channel Habitat – Opportunities to restore off-channel habitat have been identified as part of multiple studies conducted in the Chehalis watershed (Grays Harbor County 2011, Anchor QEA 2012, Chehalis Basin Work Group 2014). Of these opportunities within the basin, seven potential projects in the Upper Chehalis basin were evaluated in 2014 to determine their projected success on fish populations (three of which were located in Lewis County (see the red dots in Figure 9)).[2] These projects were considered as possibilities to improve fish and wildlife habitat, though additional studies about the effect of non-native species within the off-channel areas created by the projects was considered necessary. As stated in the analysis, "(Projects to create off-channel habitat) need to be approached

[2] Of the off-channel habitat projects evaluated, none of the Lewis County projects were included in the top two projects. A project on the Skookumchuck in Thurston County, and the Chehalis mainstem in Grays Harbor County were considered the most important off-channel habitat projects for the basin

with caution to ensure they provide the intended benefits and not increase habitat for non-native invasive species" (Chehalis Basin Work Group 2014, p. 115).[3]

If evaluation of these projects show that these projects are successful, a variety of other potential sites can be targeted for implementation (see orange dots in Figure 9 and Table 1) (Anchor QEA, 2012).

Figure 9: Priorities for Off-Channel Habitat Enhancement



[3] If off-channel restoration projects prove effective (and enhancements are not cancelled out by an increase in invasive species), several additional projects are possible in other areas throughout the Chehalis basin. A prioritized list of potential off-channel sites, and the likelihood of the success of the potential projects are available in Table 2 of the Chehalis River Basin Comprehensive Salmonid Habitat Enhancement Plan.

Table 1: Priorities for Protection and Restoration in the Chehalis River Watershed

Identification	Location	Project Description	Priority
CH-6	State Route 6 oxbow	Oxbow reconnection, riparian restoration, install large woody debris	2
CH-7	Oxbow lake reconnection	Oxbow reconnection, riparian restoration, install large woody debris	2
CH-20	Near RM 68	Oxbow reconnection, side channel/floodplain enhancement	8
CH-21	Near RM 78	Oxbow reconnection, side channel/floodplain enhancement	6
CH-23	Near RM 82	Side channel/floodplain enhancement	10
CH-24	Near RM 83	Floodplain/off-channel enhancement	10
CH-26	Near RM 89	Floodplain/off-channel enhancement	6
This table only shows projects that are ranked within the top 10 rankings in Table 6 of Anchor QEA (2012). Project rankings go from 1 to 35, and numbers lower than 10 are not shown.			

Mitigate Flood Hazards – Beyond opportunities for habitat improvement, a variety of flood reduction strategies have been identified within the Chehalis River Basin (LCCD 2012, Tetra Tech/KCM and Triangle Associates 2003, HDR Inc. 2014). Many of these projects would improve shoreline ecological functions, in addition to their primary objective of reducing flood impacts. Potential projects include the installation of structures to trap large woody debris during flood events, the use of measures to better achieve streambank protection, and the improvement of floodplain connectivity to the river (LCCD 2012). An evaluation of the most recent set of projects to mitigate flood hazards was conducted in 2014 (HDR Inc. 2014). High priority projects that promote flood hazard mitigation and improved shoreline ecological functions are presented in Appendix B.

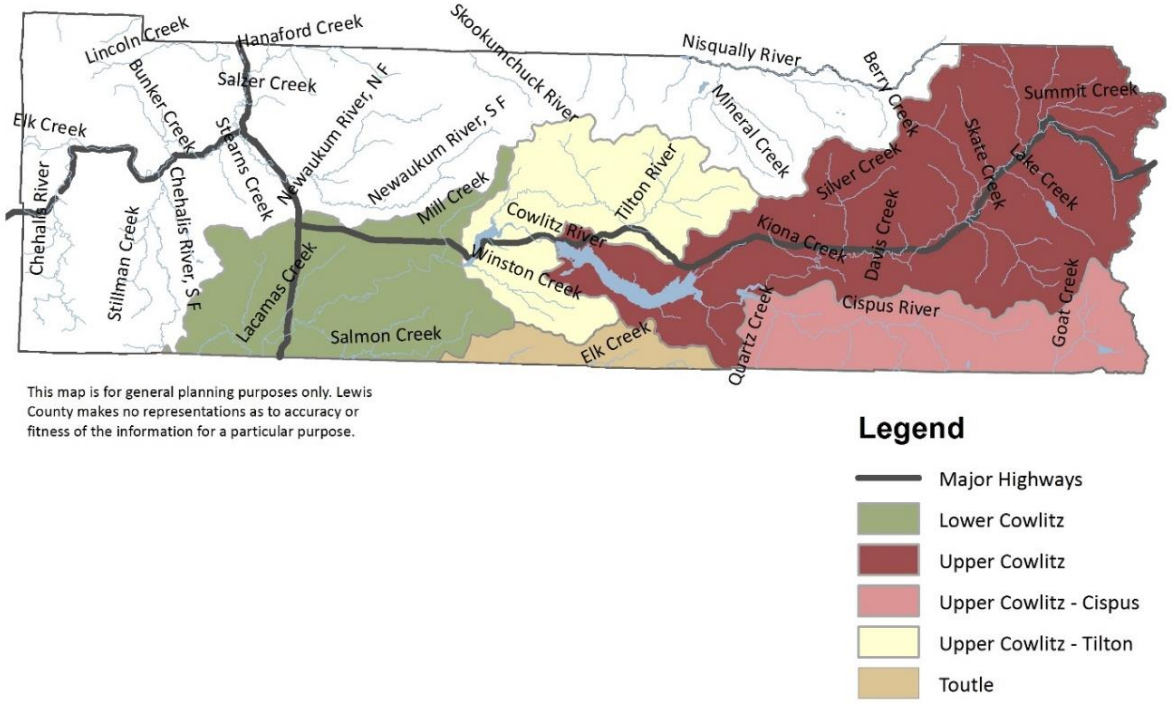
Other Efforts – Beyond these projects numerous other items have been proposed or are being implemented in the Chehalis watershed to promote the restoration of stream habitat. These projects include the restoration of wetlands to enhance water storage (Tetra Tech/KCM and Triangle Associates 2003), the removal of selected floodplain fills, and the pursuit of aquifer recharge in the Newaukum Basin (Tetra Tech/KCM and Triangle Associates 2003), among numerous other items. Each of these projects may in some way be desirable, but, given all the potential projects within the watershed, not all of them will be funded or pursued.

Cowlitz – (WRIA 26)

Overview

The Cowlitz basin encompasses 586.4 miles of jurisdictional riverine shoreline and approximately 1,430 square miles in Lewis County. The basin includes the Cowlitz mainstem and a variety of sizable and less significant tributaries (including the Cispus and Tilton Rivers, and Skate and Silver Creeks). Three subbasins have been used to best match the available information relevant to potential restoration projects (the Lower Cowlitz, the Toutle, and the Upper Cowlitz (including the Upper Cowlitz, Tilton, and Cispus watersheds) (see Figure 10). The Cities of Morton and Winlock are both located within the Cowlitz basin – Winlock within the Lower Cowlitz subbasin and Morton is located within the Upper Cowlitz subbasin

Figure 10: Subbasins within the Cowlitz River Watershed



Key Issues

Hydropower has affected the bulk of the upper and lower portions of the Cowlitz River watershed.

Within the Lower Cowlitz, hydropower development along the mainstem of the Cowlitz has significantly altered flows and degraded the available in-stream habitat. The system of dams has reduced the peak river flows (and associated channel migration) and limited the amount of large woody debris and gravel that travels downstream, ultimately decreasing the complexity of the channel habitat (Wade 2000, LCFRB 2010a, LCFRB 2010b).

Upstream in the Upper Cowlitz, the hydropower system has completely blocked salmonid fish passage and hindered the travel of fish to their historical spawning and rearing areas (in the Tilton, Cispus and Upper Cowlitz basins). Migrating adult and juvenile salmon are currently trucked around the system of dams in the attempt to restore salmonid populations to viable levels upstream (LCFRB 2010a).

Beyond these conditions, portions of the Cowlitz basin display the following impairments:

Within the Lower Cowlitz basin:

- Agricultural operations, urbanization, and the dams have contributed to a lack of side-channel habitat and floodplain connectivity along each of the rivers (Wade 2000, Tetra Tech 2007, LCFRB 2010b).
- Riparian habitat is limited along the majority of streams and rivers. Some areas along the Cowlitz mainstem and tributary streams are adequately shaded, but most areas do not have an adequate conifer component or buffer width (Wade 2000).

- Limited large woody debris is present along the Cowlitz and tributaries to the river (such as Olequa Creek, Lacamas Creek, etc.) (Wade 2000, LCFRB 2010b).

- Low in-stream flows characterize some of the tributaries to the Cowlitz during dry summer months (Wade 2000, DOE 2009, LCFRB 2010b, LCFRB 2014). Tributaries such as Olequa, Lacamas, and Little Salmon Creeks are largely reliant on rainwater for winter and summer flows (DOE 2009), and low stream flows are common after extended dry periods. These low stream flows can contribute to added water temperature and inadequate pool depth for salmon.

- Limited gravel supplementation occurs along the lower Cowlitz mainstem as a result of the dams upstream (Wade 2000, City of Tacoma 2005, Tetra Tech 2007, LCFRB 2010b).

In the Upper Cowlitz:

- Agricultural uses along the mainstem of Cowlitz River and Tilton River have resulted in numerous channel modifications, including diking, filling, and draining of floodplains and wetlands (LCFRB 2010a).

- Logging activities have been and continue to be common in much of the Upper Cowlitz watershed, especially outside of the Cowlitz river valley (GeoEngineers 2000, Wade 2000, LCFRB 2010a). These logging activities have historically had several impacts on salmon habitat and stream and river health including increased stream temperatures, reduced riparian habitat, increased sediment loads, reduced large woody debris and altered stream flow. Furthermore, many forest road culverts have created fish passage barriers that prevent salmonids from accessing spawning and rearing habitats in some of the small tributary streams.

- Water quality concerns are present in a number of the waterbodies in the Upper Cowlitz (see Figure 11) (DOE 2015). These concerns include several temperature problems, particularly in the Upper Cowlitz and Cispus subbasins.

- Logging and roads adjacent to rivers and streams have historically contributed to increased sediment loads within a number of the streams in the Upper Cowlitz basin (Wade 2000). These additional sediments have aggregated stream channels, impacted bank stability, and decreased habitat due to the pervasiveness of fine particles. The Cispus River and a number of its tributaries in particular have exhibited low channel stability, a lack of stable large woody debris, the isolation of floodplain terraces, rapid bank erosion, and marginal side channel habitat (Habitat Work Schedule 2015).

- Elevated peak flows and low summer flows appear to be an issue within the Tilton subbasin (Wade 2000). Limited low-velocity areas exist within the basin and during peak flow events "stream systems are often scoured of most spawning substrates, channels are altered, and juvenile attempting to rear in the system are flushed into Mayfield Reservoir" (p.154). Low flows also negatively impact the health of salmon habitat by encouraging higher stream temperatures and providing inadequate water and pool depth for fish during particular periods.

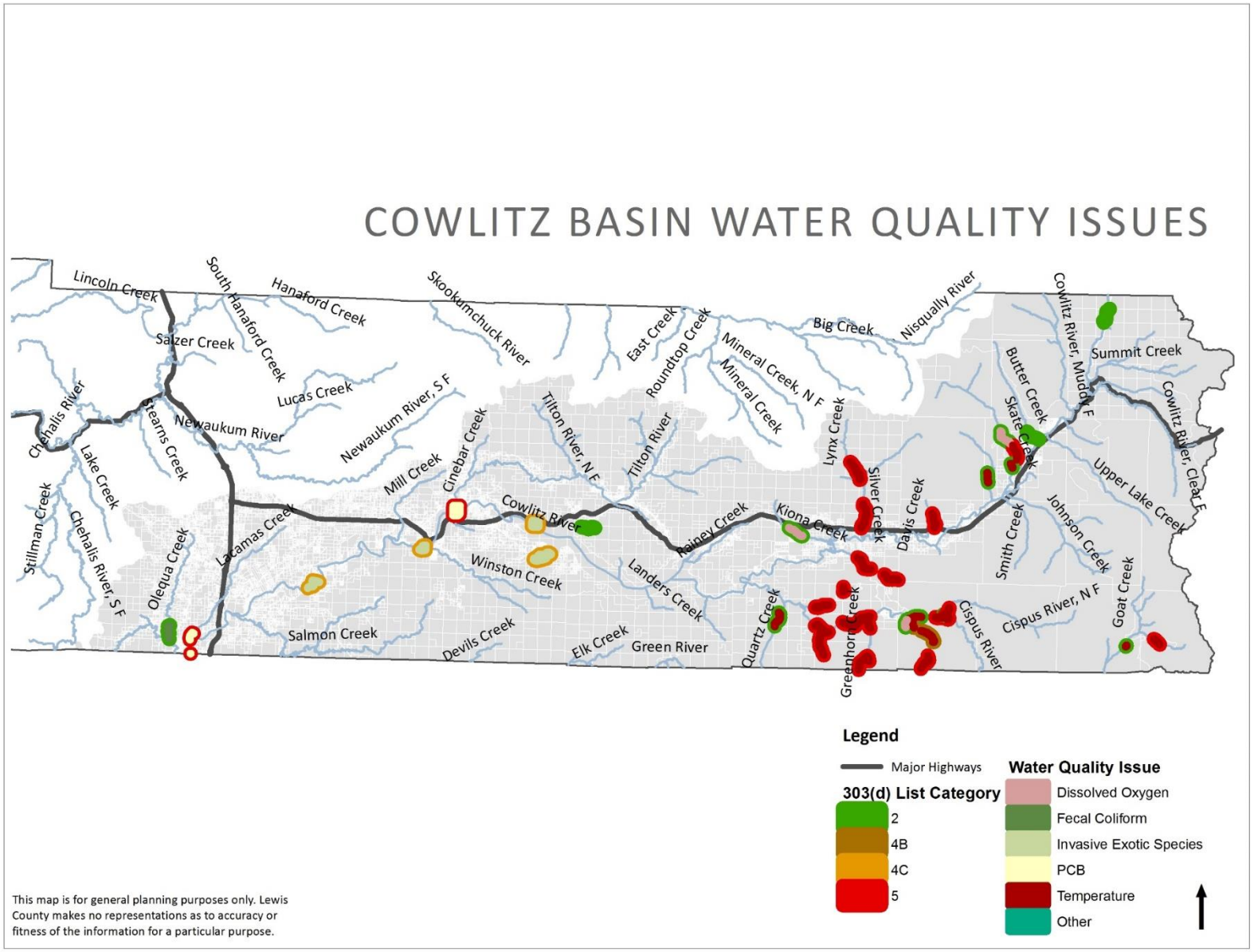
- Flooding is a concern for a number of settlements within the Upper Cowlitz basin. Several groups of homes are located within the floodplains of the Cowlitz, Cispus and Tilton Rivers, and some communities such as Packwood and Randle experience both mainstem flooding and

backwater flooding (where tributaries such as Silver and Skate Creeks enter the Cowlitz) (GeoEngineers 2000).

Within the Toutle basin:

- Sedimentation and fish barriers associated with the eruption of Mount Saint Helens in 1980 are prevalent throughout much of the watershed (Wade 2000, LCFRB 2010c).
- Important habitat for several species of salmon is present within the Green River basin. The basin was spared from the severe impacts associated with the 1980 eruption (which most of the Toutle system experienced), and existing river reaches are primarily impacted by forestry operations (LCFRB 2010c).
- The condition of riparian habitat is largely degraded within the Lewis County portion of the Toutle basin (Wade, 2000).

Figure 11: Water Quality Issues in the Cowlitz Basin



This map shows water quality concerns in the Cowlitz basin, based on the Washington Water Quality Assessment list (Department of Ecology 2015). Category 2 - Waters of Concern are waters where there is some evidence of a water quality problem, but not enough to require the production of a water quality improvement project at this time. Category 4 waters are polluted waters that either have a Total Maximum Daily Load (TMDL) analysis or other pollution prevention program in place, or are effected by a non-pollutant that cannot be addressed through a TMDL. Category 5 waters are polluted waters that require the implementation of a TMDL or some other water quality improvement project.

Restoration Priorities – Basin-wide

To address these issues, the Lower Columbia Fish Recovery Board established the following goals for the various watersheds in the Cowlitz basin (LCFRB 2010a, LCFRB 2010b, LCFRB 2010c) (see Table 2).

Table 2: Priorities for Protection and Restoration in the Cowlitz River Watershed

	SUBBASIN			TYPE OF ACTION		
	Lower Cowlitz	Upper Cowlitz	Toutle	Protection[4] (SMP/FFL)	Protection/ Restoration (FERC Permit)	Restoration
Protect Stream Corridor and Function	1	2	1	x		
Protect Hillslope Processes	2	3	2	x		
Manage Regulated Stream Flows to Provide for Critical Components of the Natural Flow Regime	3	-	-		X	
Restore Access Above Hydropower System	-	1	-		X	
Create/Restore Off-Channel and Side-Channel Habitat	4	-	11			x
Restore Floodplain Function and Channel Migration Processes in Mainstem and Major Tributaries	5	4	4			x
Restore Access to Habitat Blocked by Artificial Barriers	6	9	10			x
Provide for Adequate Instream Flows During Critical Periods	7 (Tributaries Only)	8	9			x
Restore Degraded Hillslope Processes on Forest, Agricultural, and Developed Lands	8	5	5			x
Restore Riparian Conditions throughout the Basin	9	6	6			x
Restore Degraded Water Quality with Emphasis on Temperature Impairments	10	7	8			x
Restore Channel Structure and Stability	11	10	7			x

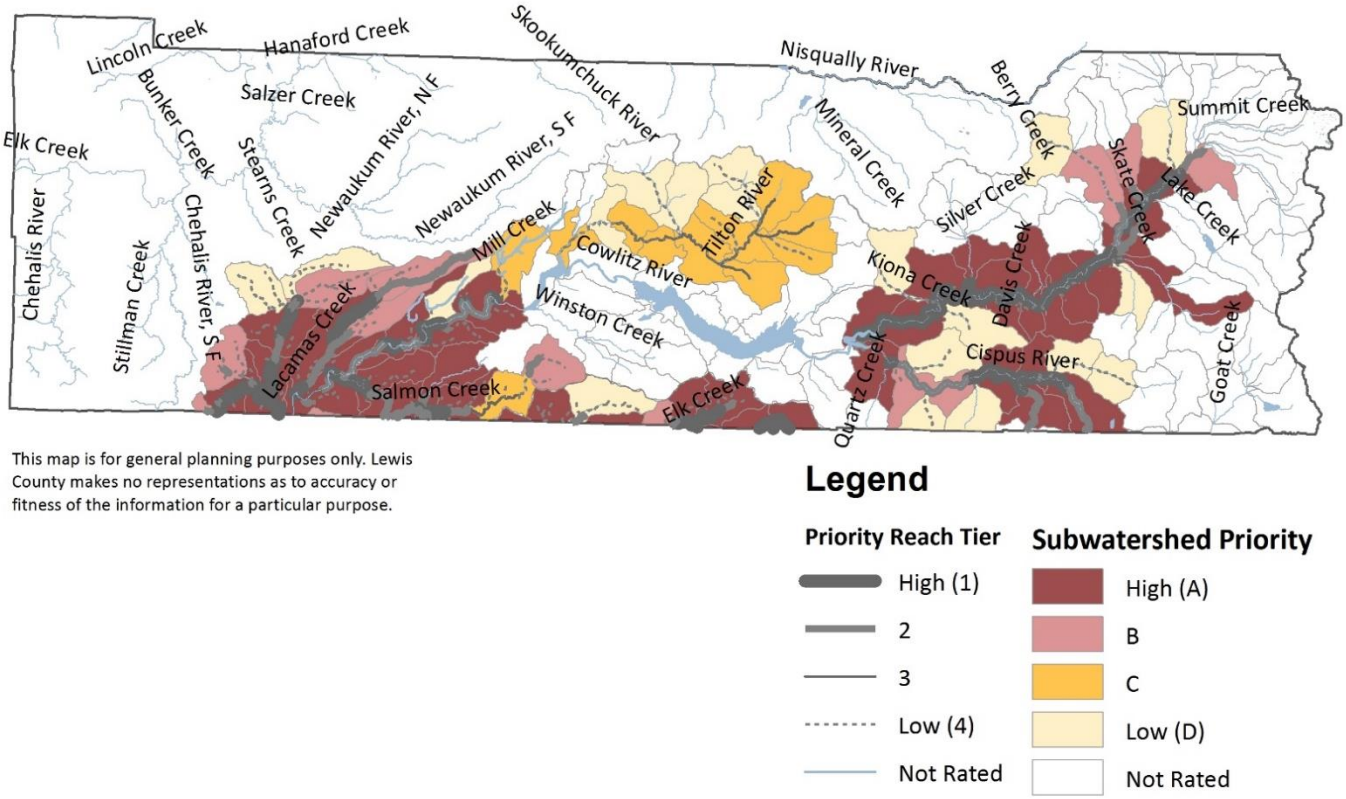
Within this table, the numbers shown represent the ranked priorities for each basin. Protection of existing high quality processes is typically emphasized and, following that, the restoration of degraded functions is sought. Where an activity is primarily intended to occur as part of a Federal Energy Regulatory Commission (FERC) License associated with the operation of dams, it has been noted.

Please note: Priority 3 for the Toutle Basin is to "address fish passage and sediment issues at the Sediment Retention Structure on the North Fork of the Toutle." The policy does not apply to Lewis County and is not shown within this table as a result.

[4] As explained above, the regulations of the Shoreline Master Program are intended to protect shoreline functions through the designation of suitable shoreline environments and the creation of standards for each of those areas. This document is intended to focus on restoration activities that enhance the overall functionality of the shoreline environment, beyond baseline shoreline conditions.

Given the basin priorities, key areas to focus projects are shown in Figure 12.

Figure 12: Priority Reaches and Subwatersheds for Restoration



Restoration Priorities – Lower Cowlitz

Within the Lower Cowlitz subbasin, the highest priority areas for protection and/or restoration are the Cowlitz River and the smaller tributaries (such as Lacamas, Olequa, Salmon and Stillwater Creeks) that are located south of the hydroelectric system of dams. Potential projects include:

Cowlitz Mainstem Improvements – With the construction of the dams along the mainstem of the Cowlitz River, the natural fluctuations in the volume of the river below the dams was altered. The spring freshet was minimized and higher than normal flows were made common during the summer, fall, and winter (LCFRB 2010b). This hydro-regulation also changed the sediment transport dynamics of the lower Cowlitz River, disrupting the sediment and transport of large woody debris below the dams. Taken together, these factors limited the power and movement of the river, and the distribution of habitat forming features such as spawning gravel and large woody debris.

To address these impacts to shoreline function, a variety of projects have been identified as opportunities to restore habitat along the Cowlitz mainstem (see Table 3 and Figure 13).

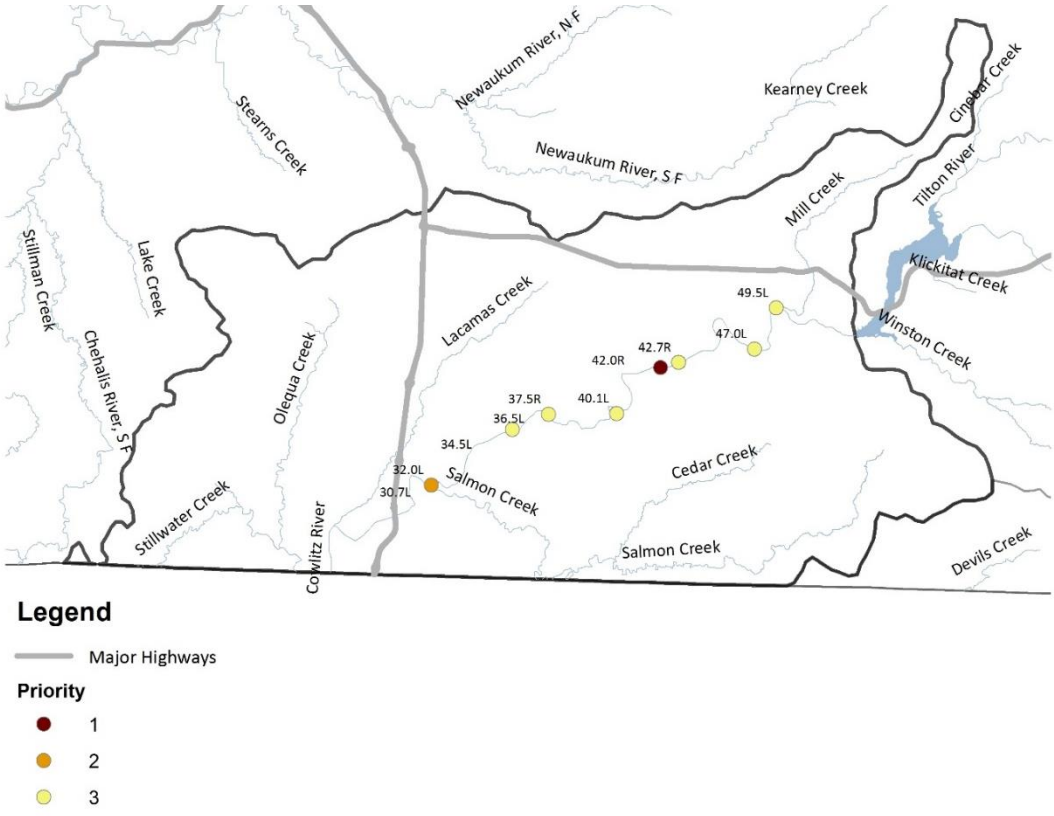
Table 3: Potential Lower Cowlitz Enhancements

Identification	Project Description	Priority
32.0L	Channel migration zone easement	2
36.0R	Side-channel restoration and enhancement	3
37.5R	Side-channel restoration	3
40.1L	Side-channel restoration and enhancement	3
42.5L	**Bar and side-channel enhancement**	**1**
42.7R	Bar and side-channel enhancement	3
47.0L	Side-channel acquisition	3
49.5L	Side-channel restoration and enhancement	3

This table only shows projects that have a priority rating from 1 to 3 on Table 5 of the Lower Cowlitz River and Floodplain Habitat Restoration: Project Siting and Design report (Tetra Tech 2007), as reflected in the revised ratings dated February 2008. Projects that had a priority rating of 4 or 5 were not included within the table.

These projects include several side-channel enhancement projects intended to improve habitat complexity in the stream channel. Where these projects are implemented, the efforts may also assist in the reduction of downstream flooding by increasing flood storage capacity of the river.

Figure 13: Priority Restoration Projects for Lower Cowlitz Mainstem (Based on Tetra Tech 2007)



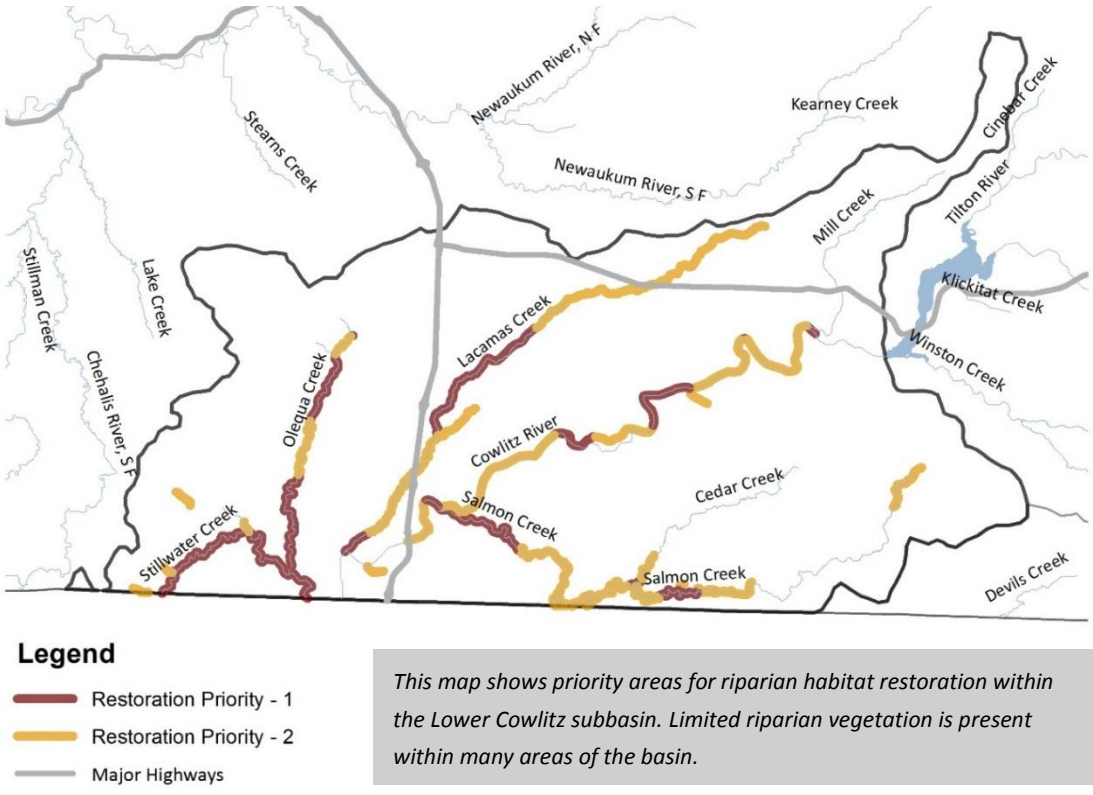
Additionally, some of the projects along the lower Cowlitz mainstem will include gravel and large woody debris in the design to ensure that the transport of these materials is enhanced within the lower portions of the river. For instance, the upcoming Otter Creek side-channel project (the only project proposed for a location with a Priority 1 rating above) will include anchored large woody debris and a gravel supplementation bar in its design to help contribute larger sediment particles to lower portions of the Cowlitz (Natural Systems Design, 2015).

Tacoma Power has similarly conducted gravel supplementation efforts in portions of lower Cowlitz. In 2002, Tacoma Power received a new 35-year license from the Federal Energy Regulatory Commission (FERC) to operate Mayfield Dam, Mossyrock Dam, and the Barrier Dam (LCFRB 2010b). As part of that permit, Tacoma Power was required to augment spawning gravel downstream of the dams to best mimic the natural characteristics historically found within the watershed (City of Tacoma, 2005).

Riparian Vegetation Protection and Restoration – Urbanization and agriculture have affected much of the riparian habitat within the Lower Cowlitz subbasin. To restore this habitat, a variety of projects and partners could be utilized (priority locations for habitat restoration, based on LCFRB, are shown in Figure 14).

Potential efforts could focus on educational activities with students to improve riparian vegetation near schools (i.e. having Winlock students plant riparian vegetation on land near Olequa Creek) or collaborative efforts with public or private landowners (such as Tacoma Power) to enhance their land. Riparian enhancement efforts will be identified on a case-by-case basis and will be dependent on property owner willingness to participate in the project.

Figure 14: Riparian Habitat Enhancement Priorities in the Lower Cowlitz

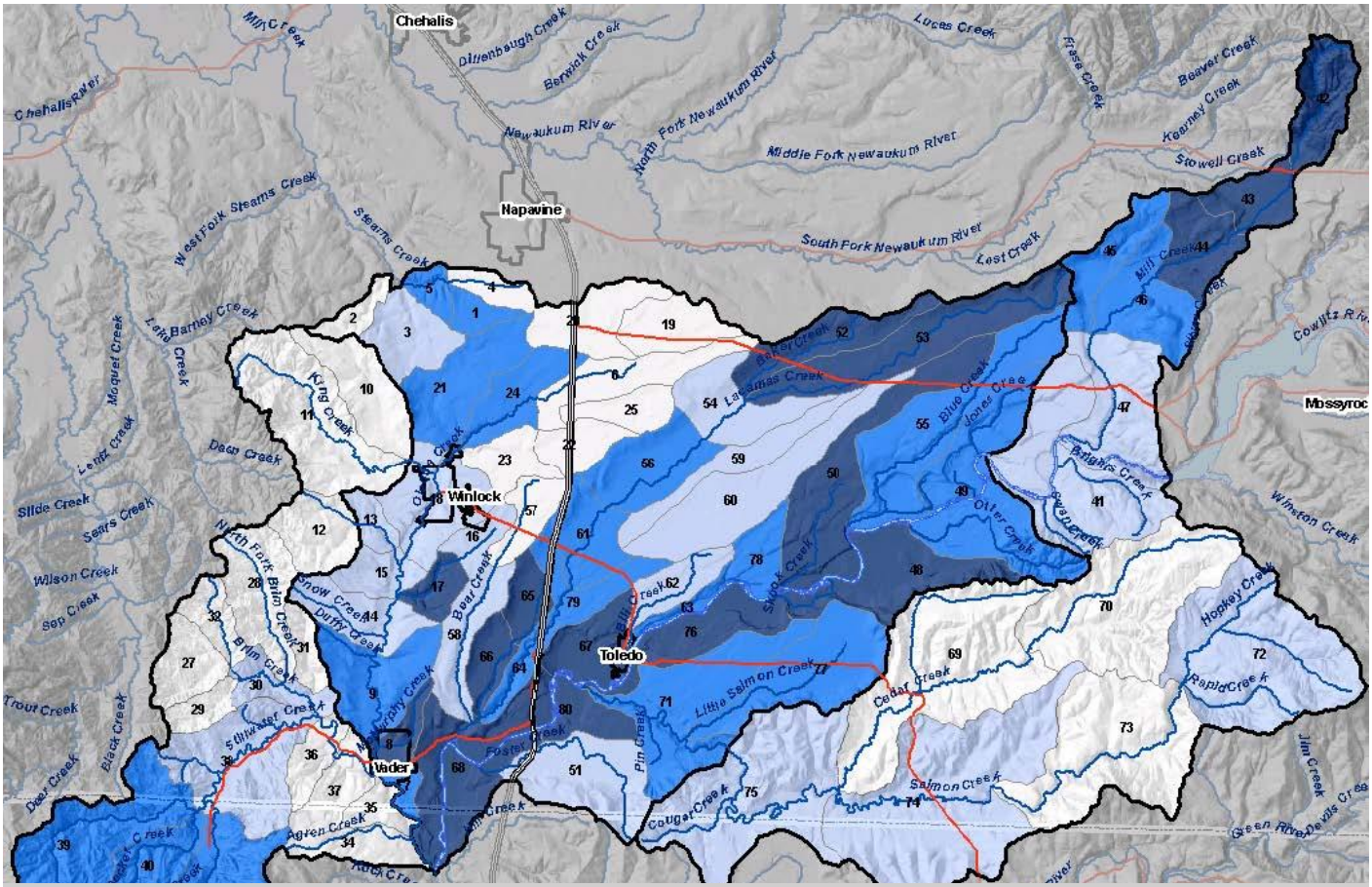


This map shows priority areas for riparian habitat restoration within the Lower Cowlitz subbasin. Limited riparian vegetation is present within many areas of the basin.

Wetland Preservation and Restoration in Tributary Basins South of the Dams – Wetlands play an important role in water storage, especially in certain tributaries to the Lower Cowlitz River. The bulk of stream flows within Olequa and Lacamas Creeks (as well as a number of smaller creeks) are dependent on recharge and rain water runoff, and wetlands help to store and slowly meter out the water (moderating peak and low stream flows).

Wetlands along Lacamas Creek and the large wetland near the headwaters of Olequa Creek (adjacent to Cardinal Glass)) provide particularly important water storage functions (DOE 2009) (see Figure 15).[5] Working to preserve and/or restore these wetlands would help to ensure adequate in-stream flow within the tributaries during extended warm and dry periods and assist in the retention of the high priority habitats within the Lower Cowlitz basin.

Figure 15: Rating of Areas Important for Water Flow Processes



Within this figure, areas in "dark blue" have the highest importance for watershed processes, areas in "blue" have moderate-high importance, areas in "light blue" have moderate importance, and areas in "white" have lower importance.

Source: *DOE 2009*

[5] The headwaters of Olequa Creek additionally have important spawning and rearing habitat for steelhead, cutthroat and coho (Wade 2000).

Restoration Priorities and Opportunities – Upper Cowlitz

Within the Upper Cowlitz subbasin, the areas that are the highest priorities for restoration are the mainstems of the Cowlitz and the Cispus Rivers, and key low-gradient tributaries, such as the mouth of Silver Creek as it travels through Randle (LCFRB, 2010a). Second-tier priorities include Hall Creek, Johnson Creek, Skate Creek (in the Upper Cowlitz Basin) and Yellowjacket Creek (in the Cispus Basin).[6] Priorities for projects are listed below.

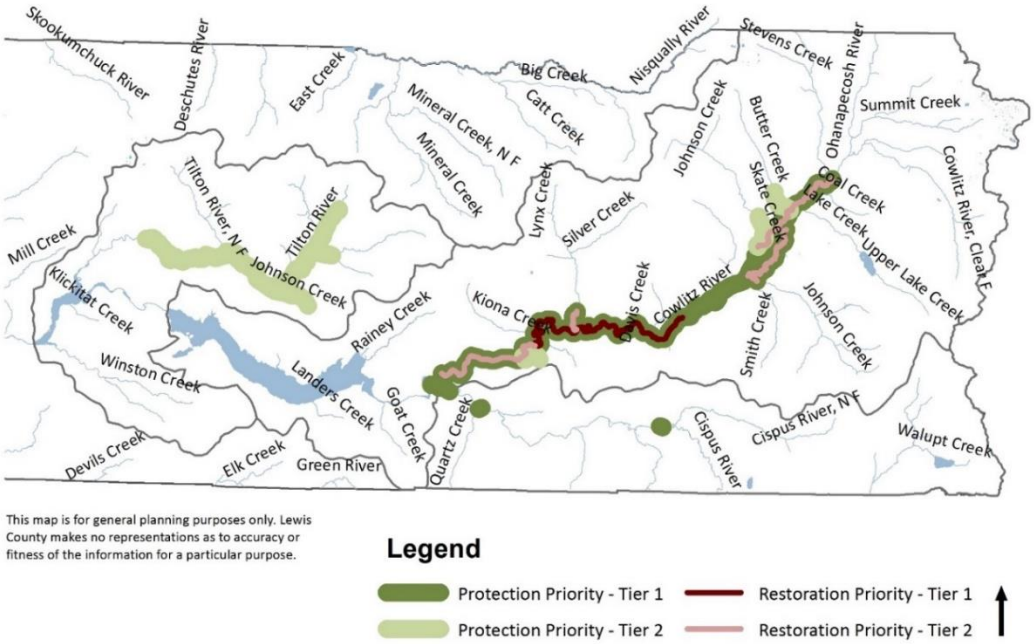
Restore Channel Function, Structure and Stability – The Cowlitz mainstem in the Upper Cowlitz Basin is a dynamic river, and has migrated significantly over the years. This migration has tended to create side channels, oxbows and braided river segments that are ideal for aquatic habitat. Over time however, many of these side channels and habitat features have been diked and filled to control the movement of the river, ultimately decreasing the habitat quality and complexity of the Upper Cowlitz (Wade 2000).

River channel functions have also been impacted in a variety of other ways throughout the basin. Sedimentation associated with logging has contributed sediments to water, widened the rivers, impacted the number of available pools, and affected bank stability (particularly in heavily logged subbasins such as the Cispus). Outside of these logged subbasins, in areas including portions of the Tilton River and lower areas along the tributaries to the Cowlitz River (such as Skate and Silver Creek), several of the streams have been affected by urban development and agricultural land use. Streams have been straightened, channelized, and diked, and wetlands and floodplains have been filled and disconnected from the streams.

Restoring the complexity of the rivers within the Upper Cowlitz basin is a key priority for fish and other restoration efforts (LCFRB 2010a). Priority streams for protection and/or restoration of channel function are shown in Figure 16. Potential restoration efforts include selective breaching, setting back, and removing structures that constrict the flow of the rivers or streams, and stabilizing stream channels to improve salmon habitat in areas characterized by rapid channel shifts and avulsion. A variety of projects that would achieve these goals are shown in Appendix D.

[6] No high priority streams for restoration are found in the Tilton subwatershed.

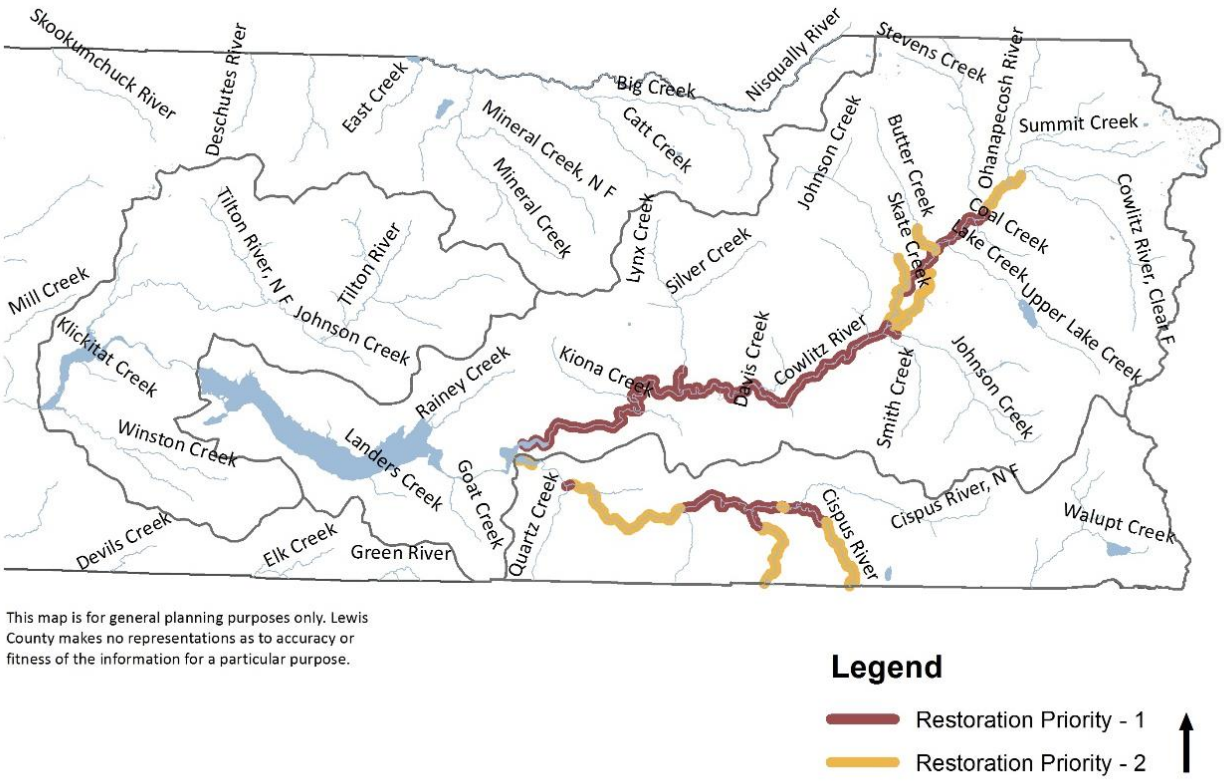
Figure 16: Rating of Areas Important for Protection and Restoration of Channel Function



Riparian Habitat Restoration – Restoration of riparian habitats within the Upper Cowlitz is also a clear emphasis within the watershed, and high priority streams and rivers are shown in Figure 17 (LCFRB 2010a). Potential projects to enhance the habitat are shown in Appendix D, and additional efforts will be identified on a case-by-case basis, based on a landowner willingness to participate in the project.

Working to Assure the Continued Implementation of the Forests and Fish Law – In addition to these items, the Upper Cowlitz watershed contains a large amount of forest property, the majority of which is subject to the State Forest Practices rules or the management plans of the Gifford Pinchot National Forest. Ensuring the continued success of these provisions (even though Lewis County is not directly responsible for the measures) will help to retain riparian vegetation, including large woody debris, along streams, and reduce the sediment and fish barrier impacts associated with forest roads (key priorities of both Wade 2000, LCFRB 2010a). Over time, these measures should contribute to the overall restoration of the watershed.

Figure 17: Rating of Areas Important for Riparian Protection and Restoration



Limiting Impacts associated with Sedimentation in Connelly Creek – Beyond these items, a final priority for considerations in the Upper Cowlitz is the protection of the water supply in Morton. Connelly Creek provides water to the City of Morton and the watershed was noted to have sedimentation issues including three dam break floods between the 1960s and 1993 (Murray Pacific 1993). When these stream turbidity events occur, the community shifts its water from its primary source to a backup source (which has manganese and iron issues that affect the palatability of the water) (Gray and Osborne, 2009).

Restoration of the Connelly Creek basin will likely be achieved by following the State Forest Practices rules, but if additional opportunities arise to preserve the quality of the water source, they should be pursued by the City.

Restoration Priorities and Opportunities – Toutle

Within the small portion of the Toutle River basin that is situated with the county, Elk Creek and the Green River are the highest priorities for restoration. Strategies to promote the restoration of these areas include:

Working to Assure the Continued Implementation of the Forests and Fish Law – The Toutle River basin is characterized by sedimentation issues and fish barriers associated with the eruption of Mount Saint Helens in 1980. Upstream portions in Lewis County are predominantly situated in forest lands and have

contain a number of features indicative of forestry activities (sedimentation, fish barriers, and a decrease in habitat diversity).

The State Forest Practices rules apply to much of the watershed, and should promote the restoration of locations within the basin. Ensuring the continued success of this law (even though Lewis County is not directly responsible for the measure) will help to retain riparian vegetation, including Large Woody Debris, along streams, and will reduce additional sediment and fish barrier impacts associated with forest roads and activities (key priorities of both Wade 2000 and LCFRB 2010c). Over time, these measures should promote the overall restoration of the watershed.

Additional Restoration Strategies

Beyond these projects, certain restoration actions should be broadly and comprehensively implemented on a programmatic basis to help achieve restoration goals. The following programmatic actions are recommended for shorelines within the coalition jurisdictions as funding permits.

Education and Incentives:

- Increase technical assistance to landowners to protect and restore shoreline habitat.
- Educate property owners about proper maintenance of septic systems, and incentive potential improvements to poorly located or failing systems wherever feasible. Target efforts particularly toward septic systems that are located within floodplains or floodways, or waterbodies, such as Mineral Lake and Carlisle Lake, which have elevated phosphorus levels that may benefit from improvements to the systems.
- Establish educational programs for local students and schools located close to area waterbodies. Potential programs could include efforts by: Centralia College and Centralia Schools to enhance the functions and hazards associated with the Chehalis River; White Pass Schools to study and restore Silver Creek and Cowlitz River processes; Morton Schools to enhance Johnson Creek and the Tilton River; and Winlock Schools to restore Olequa Creek functions.

Infrastructure Investment:

- Include habitat restoration components as appropriate within larger infrastructure projects. Potential efforts could include improving fish passage as part of a road project, replacing riprap with a softer shoreline stabilization structure or planting riparian vegetation along a road right-of-way adjacent to a stream.
- Seek to relocate utilities outside of shoreline areas during utility upgrades or replacement.
- Coordinate with state agencies to manage water withdrawals to address in-stream flows, especially in water-limited basins.
- Retrofit stormwater systems using low-impact development strategies or similar approaches.

Planning and Coordination:

- Match off- and on-site mitigation efforts to appropriate restoration and enhancement opportunities as identified in salmon recovery plans, watershed management plans and this restoration plan.
- Coordinate salmonid recovery and watershed management plans with shoreline restoration.
- Continue to monitor water quality and address point and nonpoint sources of pollution.

- Assist organizations, agencies, and private landowners in identifying funding sources and obtaining funds and technical expertise for restoration projects.
- Purchase easements or property in sensitive areas to protect shoreline functions where existing regulatory programs are inadequate.

Potential Partners and Funding for Restoration

In addition to the management-area-specific priorities and programmatic opportunities summarized in the previous sections, several broad-scale public and private groups and programs are available to assist with Coalition restoration efforts. These programs are described below.

Chehalis River Basin Land Trust

The Chehalis River Basin Land Trust (CRBLT) promotes the protection of lands that provide habitat for wildlife and fish in the Chehalis Basin. Created in 1995, the CRBLT is a nonprofit sponsor of the Land Trust Alliance that focuses on permanent conservation easements, riparian and wetland restoration projects, and land acquisition.

Columbia Land Trust

The Columbia Land Trust (CLT) is a private, nonprofit organization that works with willing landowners to conserve vital habitat in the Columbia River region (including portions of Washington and Oregon). The CLT acquires land or development rights (easements) via direct donations or by purchasing the land outright. The trust also identifies threatened lands that have significant scenic, environmental, or recreational value and targets those areas for conservation.

Gifford Pinchot Task Force

The Gifford Pinchot Task Force is a non-profit organization that utilizes volunteer efforts, education, and advocacy to promote the conservation and restoration of forests, rivers, fish, and wildlife. The organization seeks a biologically diverse and resilient forest in Washington's south Cascades that incorporates sustainable resources that support local communities and recreation, and includes the Gifford Pinchot National Forest at its center.

Lewis County Conservation District

Lewis County Conservation District offers technical and financial assistance for the conservation, protection, and development of natural resources within Lewis County. Conservation programs include the:

- Conservation Reserve Enhancement Program (CREP): CREP is a voluntary program created by the United States Department of Agriculture (USDA) Farm Service Agency, Commodity Credit Corporation, and Washington State to enhance salmon habitat along eligible stream segments. For a property owner to participate, their land must have a cropping history and be physically and legally capable of being cropped. Marginal pastureland is also eligible to be enrolled, provided that it is suitable for use as a riparian buffer planted with trees. Financial incentives covered by the program include land rental costs, the cost of establishing conservation practices, and annual maintenance, monitoring, and technical assistance. The program currently has 818.1 acres enrolled with a total of 48 miles of streams buffered.

- Coordinated Resource Management (CRM) — The CRM program offers a voluntary, collaborative, approach that promotes local participation in the development and implementation of resource management programs.

- Livestock Program – The Livestock Program offers grants to conservation districts to assist owners and operators of animal feedlot operations in the creation of nutrient management plans. Grants are also available to provide cost-share funding for the implementation of BMPs, including facility gutters, livestock exclusion fencing, and manure containment facilities. Two manure spreaders are additionally available for rent through the Conservation District.

Beyond these programs, the Lewis County Conservation District utilizes the WDFW Salmonid Screening, Habitat Enhancement, and Restoration (SSHEAR) index, a priority index to rank the culverts that would benefit fish by being replaced. The Fish Passage Priority Index takes into account habitat gain, mobility, and health status of fish stocks that would benefit from increased access to the habitat, and the projected cost of projects. Coalition jurisdictions can use the resources and investigative work of the Conservation District to identify priority areas for culvert replacement.

Lower Columbia Fish Enhancement Group

The Lower Columbia Fish Enhancement Group (LCFEG) is a non-regulatory, non-partisan 501(c)(3) salmon recovery organization founded by the state legislature in 1990. Working within specific watersheds throughout Clark, Cowlitz, Lewis, Skamania, and Wahkiakum Counties, LCFEG leverages public funding through partnerships with landowners and collaborations with individuals, groups, corporations, tribes, foundations and agencies. Among their many efforts, the LCFEG leads habitat enhancement projects, sponsors a variety of public education and outreach programs, and raises native trees and shrubs to plant throughout the Lower Columbia watershed.

Lower Columbia Fish Recovery Board

The Lower Columbia Fish Recovery Board oversees and coordinates salmon and steelhead recovery in the Lower Columbia region, and serves as lead entity for the Cowlitz River watershed (including the Upper and Lower Cowlitz subbasins). The organization was established by state law in 1998, and serves as one of seven salmon recovery regional organizations in Washington State. The organization provides grants from a variety of sources and proposed $2.43 million dollars for funding in 2015.

Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) is a federal agency that provides planning, funding and technical assistance to private landowners to assist in the conservation of natural resources. NRCS activities include farmland protection, upstream flood prevention, emergency watershed protection, urban conservation, and local community projects designed to improve social, economic, and environmental conditions. Funding programs include:

- Conservation Stewardship Program (CSP): The CSP helps agricultural producers to maintain and improve existing conservation activities and adopt additional conservation actions to address priority resource concerns. Participants earn CSP payments for conservation performance, and the higher the performance, the higher the payment.

- Environmental Quality Incentives Program (EQIP): The EQIP program provides financial and technical assistance to agricultural producers to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water quality, reduced soil erosion and sedimentation, and enhanced wildlife habitat.

Salmon Recovery Funding Board

The Salmon Recovery Funding Board (SRFB) funds projects that protect high quality habitats for salmon, and restore degraded habitats to increase overall ecological health and biological productivity. Potential projects include the preservation of actual salmon habitat, and the protection of land and water resources that support ecosystem functions that are important to anadromous fish.

To request funding, applicants must submit their proposals to the appropriate watershed lead entity, and the lead entity is responsible for assembling a ranked list of projects to submit to SRFB for consideration. Potential funding opportunities that are currently available for projects in Lewis County include:

- Family Forest Fish Program: The Family Forest Fish Passage Program (FFFPP) was established by the Washington State legislature in 2003 as an incentive-based program that assists smaller private forestland owners in replacing regulatory fish barriers on their land. The FFFPP is administered by DNR, though program funding is processed through the RCO and the SFRB. The program recognizes the critical role small family forest landowners' play in the restoration of salmon populations and provides funding to replace culverts and other fish barriers that are associated with forest road stream crossings. Since 2003, the program has opened 763 miles of fish habitat, and corrected 343 fish barriers.

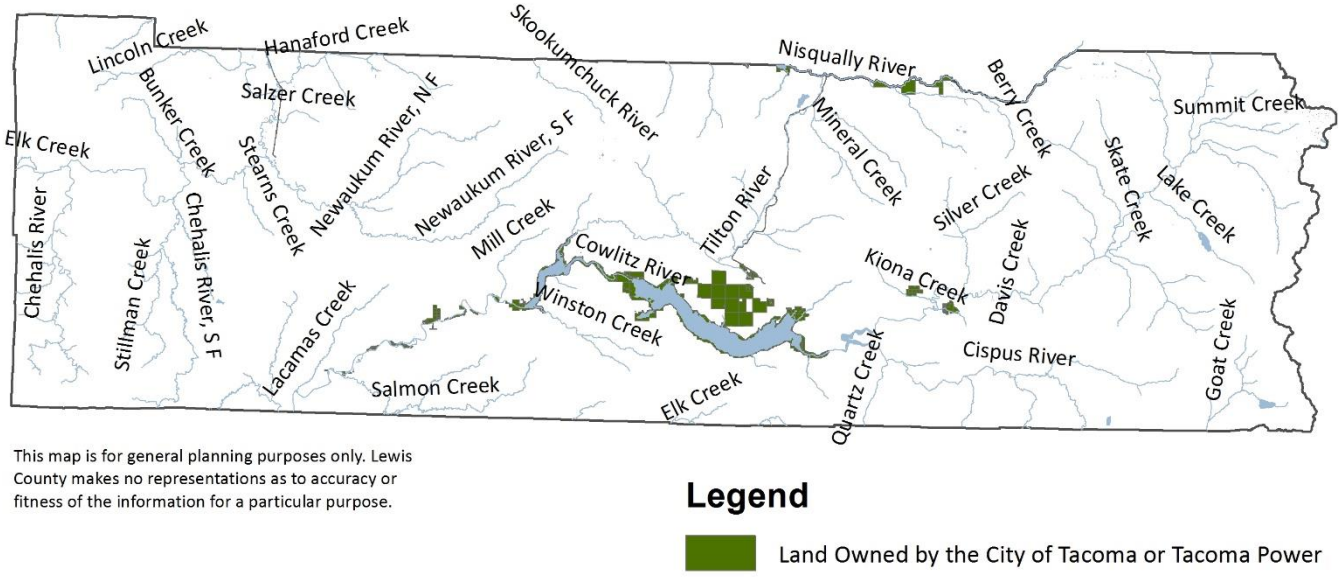
- Salmon Recovery Grants: Salmon Recovery Grants are awarded for projects that protect existing, high quality habitats for salmon, and restore degraded habitat to increase overall ecological health and biological productivity. Grants are also awarded for feasibility assessments to determine the viability of future projects and other salmon-related activities. Projects must be developed using scientific information and local citizen review, and must demonstrate the capacity to be implemented and sustained effectively to benefit fish.

Tacoma Power

Tacoma Power is one of the largest owners of land within the Upper and Lower Cowlitz subbasins[7] (see Figure 19). As part of the operating permit for operating the Mayfield and Mossyrock dams, Tacoma Power (or its parent organizations, the City of Tacoma or Tacoma Public Utilities) had to purchase thousands of acres to help mitigate the impacts associated with the dams. A variety of opportunities exist to partner with Tacoma Power to enhance these lands.

[7] The City of Tacoma, Tacoma Public Utilities or Tacoma Power also own some lands in the Nisqually basin in Lewis County.

Figure 18: Land Owned by the City of Tacoma or Tacoma Power



Much of the land purchased by Tacoma Power for the mitigation of the dams is located in the Cowlitz Wildlife Area, an area that includes roughly 15,000 acres of forests, wetlands, lowland valleys, riparian habitats, and shorelines. This wildlife area, funded by Tacoma Power and managed by the Washington Department of Fish and Wildlife, borders the entirety of Riffe Lake and much of Mayfield Lake, and includes lands such as Davis Lake (a water body that feeds Johnson/Lake Creek just outside of Morton) and Peterman Ridge (a large hill overlooking Riffe Lake). Protection and management of the habitat for native species is a key focus of Tacoma Power and the Washington Department of Fish and Wildlife's management efforts.

Beyond the lands within the Cowlitz Wildlife Area, Tacoma Power also owns a significant amount of shoreline property along the lower Cowlitz. These lands include some of the prime areas proposed for side channel habitat proposed along the lower stretches of the river (Tetra Tech 2007). Partnering to enhance these areas, offers several ideal opportunities to enhance fish resources within the lower Cowlitz.

US Environmental Protection Agency: Region 10 Pacific Northwest

The US Environmental Protection Agency (USEPA) funds a variety of projects that are intended to protect human health and safeguard the natural environment. Potential opportunities specific to watershed protection and restoration are listed below.

- Clean Water State Revolving Fund (CWSRF): The CWSRF program provides grants to states to capitalize their state loan funds. The states, in turn, offer loans to communities, individuals, and other agencies for high-priority water-quality activities. Wetland protection and restoration, and the development of riparian buffer zones, among other projects can be funded by the low-interest loans.

- Environmental Education Grants: This program funds a broad range of environmental education, training, and outreach activities, including the design, demonstration, or dissemination of environmental education practices, methods, and techniques. Grants are awarded to governmental agencies, universities and nonprofit organizations.

US Fish and Wildlife Service

The US Fish and Wildlife Service offers several grant programs that fund restoration-oriented projects. The programs are typically tailored to the particular goals of the agency, and vary from year-to-year. Among the current funding opportunities include:

- Chehalis Fisheries Restoration Program: The Chehalis Fisheries Restoration Program provides funding for habitat restoration in the Chehalis River and Grays Harbor Basins. Eligible applicants include private landowners, nonprofit organizations, and governmental agencies. Eligible projects include corrections to fish passage barriers, removal of invasive species, native plant revegetation, riparian habitat enhancement, restoration of off-channel fish habitat, and enhancement of agricultural wetlands for fish use.

- Cooperative Endangered Species Conservation Fund: The Cooperative Endangered Species Conservation Fund supports participation in a wide array of voluntary conservation projects for candidate, proposed and listed species. The funds may in turn be awarded to private landowners and groups for conservation projects.

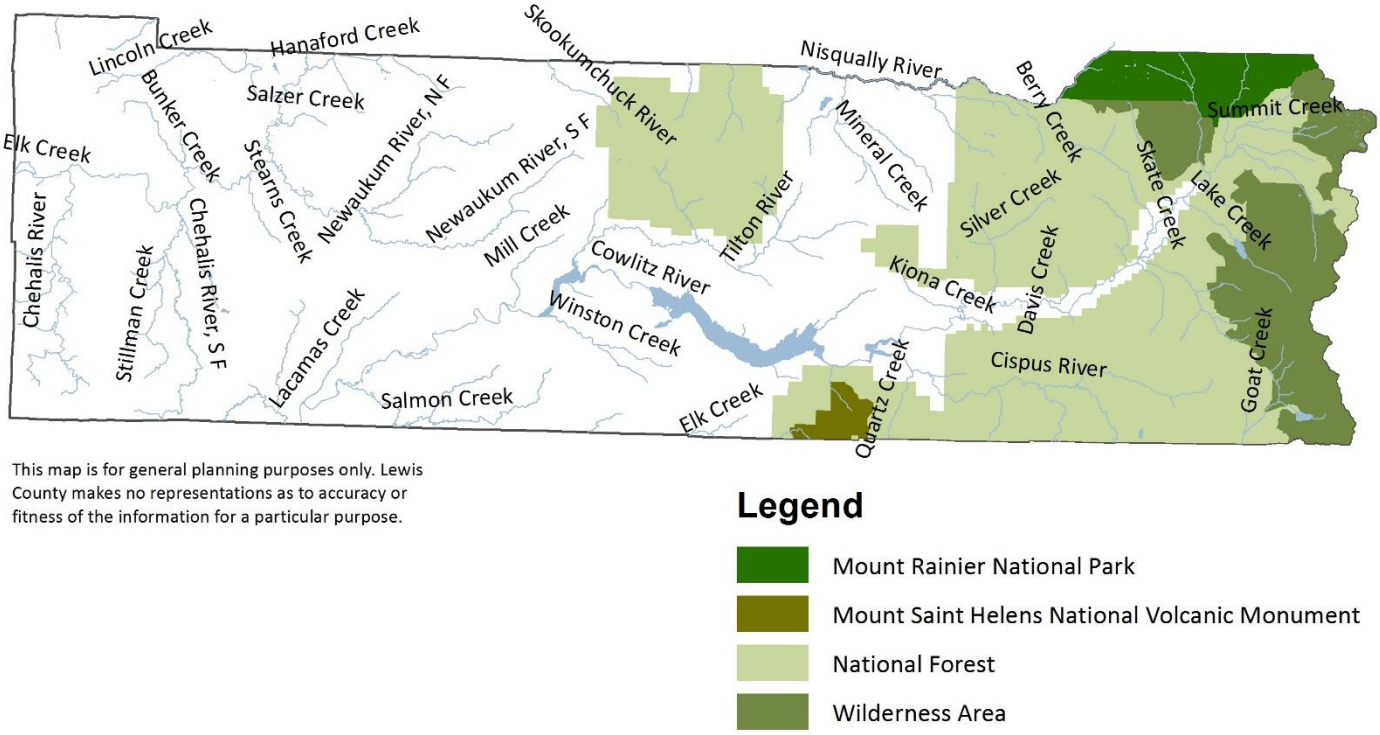
- National Fish Program: The National Fish Passage Program provides funding to restore native fish and other aquatic species to self-sustaining levels by reconnecting habitat that has been fragmented by human-made barriers. Private landowners, nonprofit organizations, and local, tribal, state, and federal agencies are eligible to apply for the funding.

- North American Wetlands Conservation Act (NAWCA): The NAWCA program provides matching grants to wetland conservation projects in the United States, Canada, and Mexico. Two types of grants are available (a Standard and a Small Grants Program), and both are competitive and require that requests be matched by partner contributions at no less than a 1-to-1 ratio.

US Forest Service

The US Forest Service administers the bulk of the property in east Lewis County as part of the Gifford Pinchot National Forest (see Figure 19). Lands within the forest include public and private forest lands, wilderness areas, and the Mount Saint Helens National Volcanic Monument. The service is undertaking several efforts to enhance habitat in these areas, while ensuring continued resource-based use of the lands.

Figure 19: Federal Land Management in East Lewis County



Washington State Department of Ecology

The Washington State Department of Ecology has a variety of programs that may be used for restoration projects. Among these programs include:

- Flood Control Assistance Account Program (FCAAP): This program provides funding for the development of comprehensive flood hazard management plans, feasibility studies, flood control maintenance projects, and emergency flood-related efforts. The funding may also be used for levee setbacks or floodplain reconnection projects, so long as flood hazards are reduced. The funding is one of a very few state programs in the country that provides grant funding to local governments for floodplain management planning and implementation actions. Counties, cities, towns, conservation districts, flood control zone districts, and any other special districts as defined in WAC 173-145 are eligible, though the funding requires a 25 percent match in non-state money for most awards. Grant awards are up to $500,000.

- Water Quality Grants: The Department of Ecology offers a number of grants related to improving water quality. To access these funds, project proponents can submit one application to apply Centennial grants or loans, Section 319 grants or Clean Water Act State Revolving Fund (CWSRF) loans. Eligible projects include education and stewardship, water quality monitoring, water quality planning, riparian and wetland habitat enhancement, stream restoration, and total maximum daily load (TMDL) plan development and implementation. A 25 percent match is required and projects may be funded up to $500,000, if matched with cash, or $250,000, if matched in other ways.

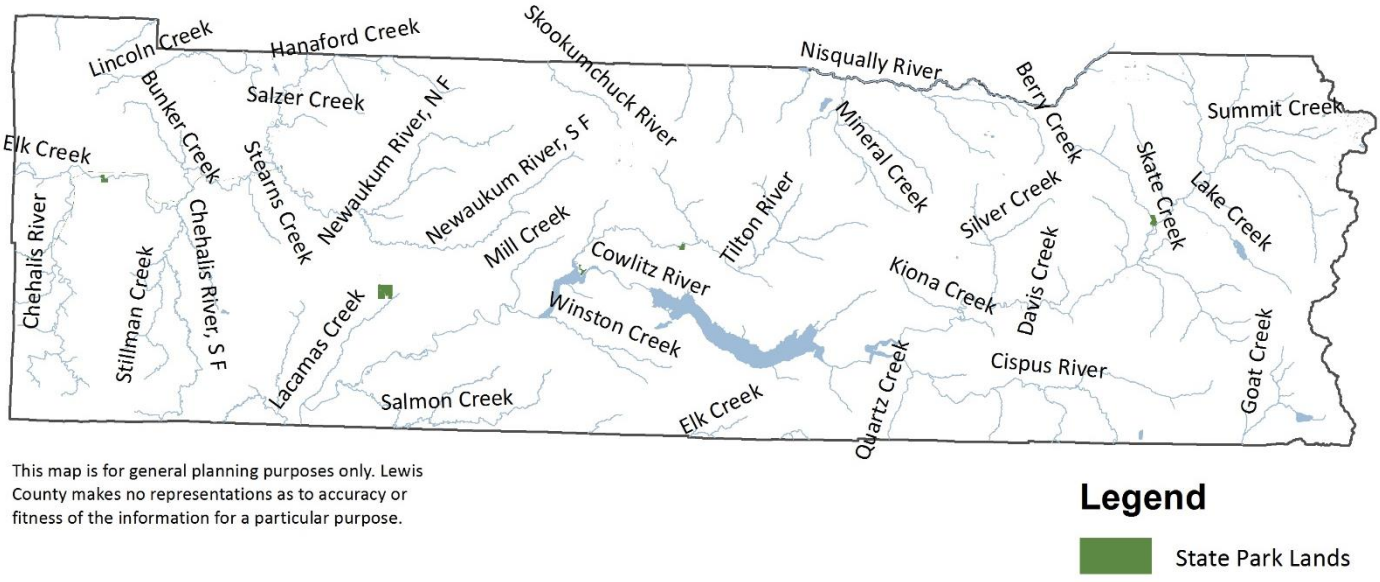
Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife manages the 15,420 acre Cowlitz Wildlife Area for Tacoma Power. The wildlife area was purchased by Tacoma Power as wildlife mitigation for the Mayfield and Mossyrock dams on the Cowlitz River, and the majority of the land base can be classified as one of four habitats – emergent wetland, riparian/forested wetland, coniferous forest, and mixed deciduous forest. Several forage pastures are also maintained.

Washington State Parks

Washington State Parks works to provide destinations with natural, cultural, recreational, artistic, and interpretive experiences that all Washingtonians can enjoy. Within Lewis County, Washington State Parks owns and operates, Rainbow Falls State Park and the Willapa Hills Trail (on the Chehalis River mainstem), Ike Kinswa State Park (on Mayfield Lake) and Lewis and Clark State Park. Beyond these areas, Washington State Parks also owns land along the Tilton River and property near Packwood (at the junction of Skate Creek and the Cowlitz River), though no plans have been created for the development of these lands. A variety of restoration efforts could be conducted in partnership with Washington State Parks in each of these areas.

Figure 20: State Park Lands



Washington State Recreation and Conservation Office

The Washington State Recreation and Conservation Office provides a variety of funding for the acquisition and development of recreation and conservation lands. Programs include:

- Aquatic Lands Enhancement Account (ALEA): In 1984, the Washington State legislature created ALEA to ensure that money generated from aquatic lands was used to protect and enhance those lands.

Grants may be used for the acquisition, improvement, or protection of aquatic lands for public purposes, and are targeted at re-establishing the natural, self-sustaining ecological functions of shorelands, providing or restoring public access to the water, and increasing public awareness of aquatic lands as an irreplaceable part of our public heritage. Funding for the program is provided almost entirely by revenue generated by the DNR's management of state-owned aquatic lands.

- Land and Water Conservation Fund (LWCF): The LWCF program provides funding to preserve and develop outdoor recreation resources, such as parks, trails, and wildlife lands. Eligible projects require a 50 percent match, of which 10 percent must be non-federal.

- Washington Wildlife Recreation Program (WWRP): The WWRP is a state grant program that offers a variety of different funding options to protect habitat, restore habitat and species, and acquire properties with valuable natural resources. Current funding categories include: critical habitat; farmland preservation; local parks; natural areas; riparian protection; trails; urban wildlife habitat; and water access. Eligible applicants are required to have an adopted Parks Plan that meets necessary state standards prior to submitting a grant request.

Western Native Trout Initiative

The Western Native Trout Initiative is meant to serve as a catalyst for the implementation of conservation or management actions through partnerships and cooperative efforts that result in improved trout species status, improved aquatic habitats, and improved recreational opportunities. The initiative funds a variety of projects, including riparian restoration, invasive species removal, fish passage barrier correction, and wetland and estuary restoration. Private landowners, nonprofit organizations, and local, tribal, state, or federal agencies are eligible to apply for funding through the program.

Land Conservation Programs

Beyond these partner organizations and potential funding sources, programs to reduce taxes associated with open space or timber lands are also available to help incentivize the preservation of property. Available programs include:

- Forest Taxation: Forest taxation (or the approach also known as the timber tax) is an excise tax that began in 1971, when the Legislature excluded timber lands from property taxes. The intent of this taxation is to provide uniform, predictable and fair taxes for forest landowners and ensure that taxes do not impact the economic incentives for growing timber on private lands. In place of a property tax on trees, timber owners pay a 5 percent excise tax on the stumpage value of their timber when it is harvested.

- Open Space Taxation: The Open Space Taxation Act, enacted in 1970, allows property owners to have land valued at its current use rather than its highest and best use. The Act grants certain lands a reduction in taxes to assure the continued use and enjoyment of the natural resources and scenic beauty of Washington. Lands suitable for the program include lands where the current use conserves or enhances natural or scenic resources; protects streams or water supplies; or promotes the conservation of soils, wetlands, beaches or historic or archaeological sites.

Implementation and Monitoring

Effective implementation of restoration projects and programs will require partnerships and collaboration to be effective. The restoration opportunities described herein will entail the acquisition of easements on private land or the restoration of another agency's property in many cases, and coordination with citizens, landowners, and other stakeholders will be necessary.

Timelines and Benchmarks

Many aspects of restoration can be highly opportunistic[8] and do not lend themselves to the creation of timelines. The use of timelines is also complicated by the fact that shoreline restoration may largely depend on grant funding, which is unpredictable at best. That said, it is important to set specific goals and benchmarks to ensure progress. Potential guidelines for the implementation of this plan are as follows:

Within 0 to 7 years of adoption of this plan, jurisdictions and partners within the Coalition will attempt to:

- Implement at least one potential floodplain or side-channel reconnection project that provides a high level of ecological function.
- Enhance riparian areas in at least three shoreline areas that are suitable for riparian enhancement (including the removal of invasive vegetation).
- Identify and complete design work on at least three public agency sponsored fish barrier removal projects.
- Create a new public access point to at least one shoreline area, as part of a larger restoration effort.
- Develop and implement at least one restoration program using public outreach, education or incentives to engage private landowners or area students.

Within 7 to 10 years of adoption of this plan (assuming funding is available), jurisdictions and partners will attempt to:

- Implement at least one potential floodplain or side-channel reconnection project.
- Enhance riparian areas in at least two shoreline areas.
- Complete at least two public agency sponsored fish barrier removal projects.
- Create new public access to at least one shoreline area, as part of a larger restoration effort.

[8] Opportunistic restoration periods include instances where one finds a willing landowner, or where an event creates an opportunity to make a positive ecological improvement.

- Continue to operate the restoration program using public outreach and education or incentives to engage private landowners or area students.

Benchmarks and Evaluation

Over time, restoration efforts will be evaluated against a set of benchmarks to determine if progress is being made. Progress can be tracked by reporting benchmarks in areas such as:

- Acres of enhanced riparian habitat.
- Acres of reconnected floodplain.
- Acres of wetland restored in the shoreline jurisdiction.
- Area of functioning native vegetation planted.
- Number of fish barriers removed and/or stream miles opened to fish passage.
- Number of streams that exceeded water quality criteria as measured in the state water quality assessment.
- Number of restoration education programs occurring in local schools.
- Number of restoration actions implemented in conjunction with other project partners.

Lewis County will attempt to track restoration projects as they are implemented, and monitor the success of the efforts.

CONCLUSION

Shoreline restoration planning is an ongoing long-term effort. Given the amount of partners, funding sources available, and emphasis on watersheds in Lewis County (particularly on the Cowlitz, Chehalis, and Deschutes watersheds), it is clear that restoration has occurred and will continue within the watersheds.

Over the last twenty years, changes to best available science and regulatory requirements have influenced factors such as fish passage, forestry practices, shoreline structural stabilization, urban stormwater treatment, and a number of other issues. Government and landowner consideration and integration of these changes in policies and processes will continue to improve the ecological functions along shorelines, especially when compared with the conditions at present.

Beyond the enhancements that will occur as a result of programs or actions such as the implementation of the State Forest Practices rules, requirements related to the mitigation for or operation of the dams on the Cowlitz River, and standards for stormwater management, several individual projects or programs are possible. The combined effect of these programs, projects, policies, and regulatory changes are sure to enhance the ecological functions of shorelines in Lewis County.

Data Gaps

Monitoring Results

One of the largest data gaps found during the preparation of this plan was the lack of information on the effectiveness of past and current restoration activities in the jurisdictions within the Coalition. Projects involving barrier culvert removal/replacement and side-channel enhancement (in particular) should be monitored, and data should be used to educate landowners, gauge cost effectiveness, and determine the usefulness of different approaches.

Shoreline Armoring

At present, there is no comprehensive database of the types and extents of shoreline armoring within the Coalition jurisdictions. Shoreline armoring causes a number of physical changes to the shoreline and nearshore environment including:

In lakes:

- Loss of beach area from placement of structures.
- Impoundment of sediment behind structures, interrupting sediment transport and causing sediment starvation and beach instability.
- Modification of groundwater regimes.
- Redirection and intensification of wave energy.
- Alterations of substrate.

In streams:

- Loss of stream bank vegetation.
- Reduced shoreline and stream-bed complexity.
- Reduction in local sediment inputs to the stream.
- Concentration of high flow velocities along the toe of armored banks.
- Localized channel scour or incision.

Knowing where severe impairments exist or are likely to exist as a result of shoreline armoring would help to determine the highest priority sites for restoring natural geomorphic processes. With such information, the Coalition could develop technical guidance and implement alternatives to traditional shoreline armoring that maintain natural shoreline processes and functions.

Climate Change

Extensive research has been conducted on expected weather-related precipitation and hydrologic changes in the Cascade Mountains and the Puget Lowlands due to climate change. According to this research, the most significant change for Lewis County will be a temperature-driven shift in the type of precipitation that occurs, with less snowfall and more rainfall (Elsner et al. 2010; Dalton et al. 2013). This change would mean lower base flow in streams in the summer (due to lower snowmelt) and higher flood flows in the winter. These alterations would be particularly pronounced for basins that currently have a significant amount of snowmelt, such as basins that originate along the Cascade Crest.

Expected increase in summertime temperatures are also anticipated intensify the reduction in summertime streamflows (Abatzoglou et al. 2014). These higher temperatures, when paired with a lower streamflow, will complicate restoration efforts, particularly for projects that spread out flow over time, thus increasing the risk of drying out streams.

Changes to the climate are also expected to increase the intensity of precipitation during large storms (Muschinski and Katz 2013), as a result of the expansion in the moisture capable of being handled within the atmosphere when temperatures increase (Trenberth 2011). This intensification of the hydrologic cycle has been documented to have occurred in areas such as Lewis County in the past (Muschinski and Katz 2013), and will likely continue into the future. To ensure that restoration projects are designed and sited to be sustainable given these expected weather changes, an ongoing review of climate change research will be warranted.

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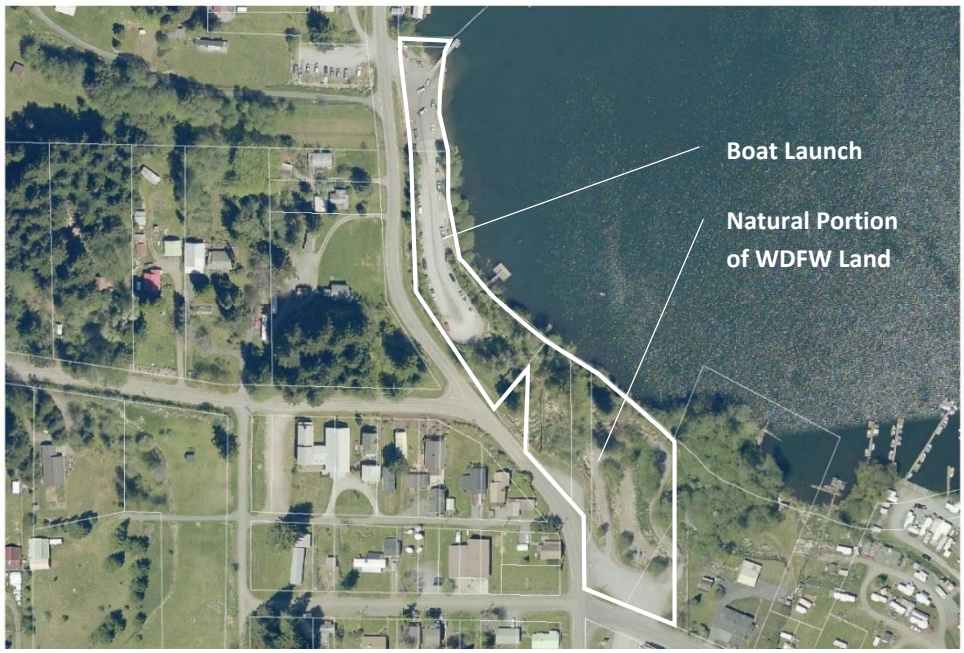
APPENDIX A – POTENTIAL NISQUALLY PROJECTS

Table A-1

Project Name	**Mineral Lake Habitat Restoration and Public Access**
Location	**Department of Fish and Wildlife Lands on Mineral Lake**



This map shows the WDFW lands on the south portion of Mineral Lake. Potential enhancement projects would focus on the natural portion of the land, and could potentially include items such as improved wayfinding to the beach from downtown, enhancement of the dirt driveway that travels through the site, and an enhanced beach access point.

Management Area	Nisqually
Project Source	Conceptual
Project Focus	Improved public access, nearshore habitat
Current Ownership	Washington Department of Fish and Wildlife
Strategy	Limitation of vehicular access, planting, and improved wayfinding for public access
Existing Conditions	Public access to the Mineral Lake shoreline is currently limited to Washington Department of Fish and Wildlife boat launch (which is comprised of a paved boat launch and a more naturalistic setting that is accessed by a dirt drive).
Project Description	This project would improve access to the shore in the more naturalistic portion of the property, by working with WDFW to improve wayfinding to the water. As part of this improvement, the project could also close the natural portions of the site to vehicles and plant additional vegetation to enhance nearshore habitat.

Table A-2

Project Name	**Mineral Lake Nearshore Restoration**
Location	**Lion's Den Campground – South End of Mineral Lake**

This map shows the Lion's Den campground on Mineral Lake. At the time this aerial was taken in 2013, the campground included ten separate docks, and at least 16 RVs parked within 30 feet of the water. Potential methods to enhance the campground include moving RVs slightly from the water and consolidating the number of docks present in the campground.

Management Area	Nisqually
Project Status	Conceptual
Project Focus	Improved nearshore habitat
Current Ownership	Private
Strategy	Slight site revision to encourage parking further from the shoreline, improved riparian vegetation, consolidation of docks
Existing Conditions	The Lions' Den Campground operates on 11.8 acres at the southern end of Mineral Lake. The campground allows numerous RVs to park near the water and offers limited if any vegetation to filter pollutant discharges from the vehicles that utilize the site. Numerous docks are also present in the area.
Project Description	Potential methods to enhance the campground include working to redesign the site to move campers away from the water and reestablishing some shoreline vegetation to help filter the sediment associated with the gravel parking lot and any discharges from the RVs or boats. Taken together, these items could help to safeguard the quality of the water quality in Mineral Lake. An additional project could also attempt to consolidate the number of docks associated with the campground to help enhance nearshore habitat.

APPENDIX B – POTENTIAL CHEHALIS PROJECTS

Table B-1

Project Name	**Middle Fork Newaukum River Barrier Removal**
Location	**Middle Fork Newaukum River, Lewis County**
	
Management Area	Upper Chehalis – Newaukum Management Unit
Project Sponsor	Habitat Work Schedule (2015). Lewis County (2015). Project Sponsor – Lewis County Conservation District
Target Habitat	Salmonid spawning and rearing habitat
Current Ownership	Private
Project Size	1 culvert
Strategy	Fish passage/barrier removal on river
Existing Conditions	A significantly undersized culvert on the Middle Fork Newaukum River acts as a fish barrier for 3.9 miles of fish habitat. The downstream end of the culvert has a 0.3 meter drop, and the culvert has a slope of 11 percent. The culvert was rated as 33 percent passable for the salmonid species that are likely to use the Middle Fork Newaukum River (including Chinook, steelhead, Coho, and coastal cutthroat trout).
Project Description	This project would remove the undersized culvert and replace it with a larger, better designed culvert that is 100 percent fish passable. The barrier replacement would provide salmonids access to 3.9 miles of river habitat upstream of the culvert.

Table B-2	
Project Name	**Lucas Creek Tributaries Barrier Removal**
Location	**Lucas Creek, Lewis County**
	
Management Area	Upper Chehalis – Newaukum Management Unit
Project Sponsor	Habitat Work Schedule (2015). Project Sponsor – Lewis County Public Works
Target Habitat	Salmonid spawning and rearing habitat
Current Ownership	County road right-of-way
Project Size	1 culvert replacements
Strategy	Fish passage/barrier removal on a tributary stream
Existing Conditions	The existing culvert has a slope greater than one percent with an interior slope break that creates a 60 percent constriction within the pipe. The culvert is estimated to pose a barrier to 33 percent of adults and 67 of juvenile salmonids.
Project Description	This project would replace the existing culvert with a larger culvert that would meet the design criteria for a 100-year storm event. The culvert would be realigned 30 degrees (from its present configuration) to encourage a more natural stream functioning, and reduce the high creek velocities and scouring associated with the mouth of the pipe. The project would offer salmonids improved access to more than 2,588 square meters of spawning habitat and 1,299 square meters of rearing habitat.

Table B-3	
Project Name	**Tributary to Salzer Creek Barrier Removal**
Location	**Unnamed Tributary to Salzer Creek, Lewis County**
Management Area	Upper Chehalis – Newaukum Management Unit
Project Source	Lewis County Public Works (2015). Conceptual
Target Habitat	Salmonid spawning and rearing habitat
Current Ownership	County road right-of-way
Project Size	1 culvert
Strategy	Fish passage/barrier removal on a tributary stream
Existing Conditions	Culvert 021(15051)(03086), is 67 percent passable and limits access to 14.05 of upstream habitat.
Project Description	The existing culvert would be replaced with a more fish-friendly culvert that would open up better access to habitat upstream,

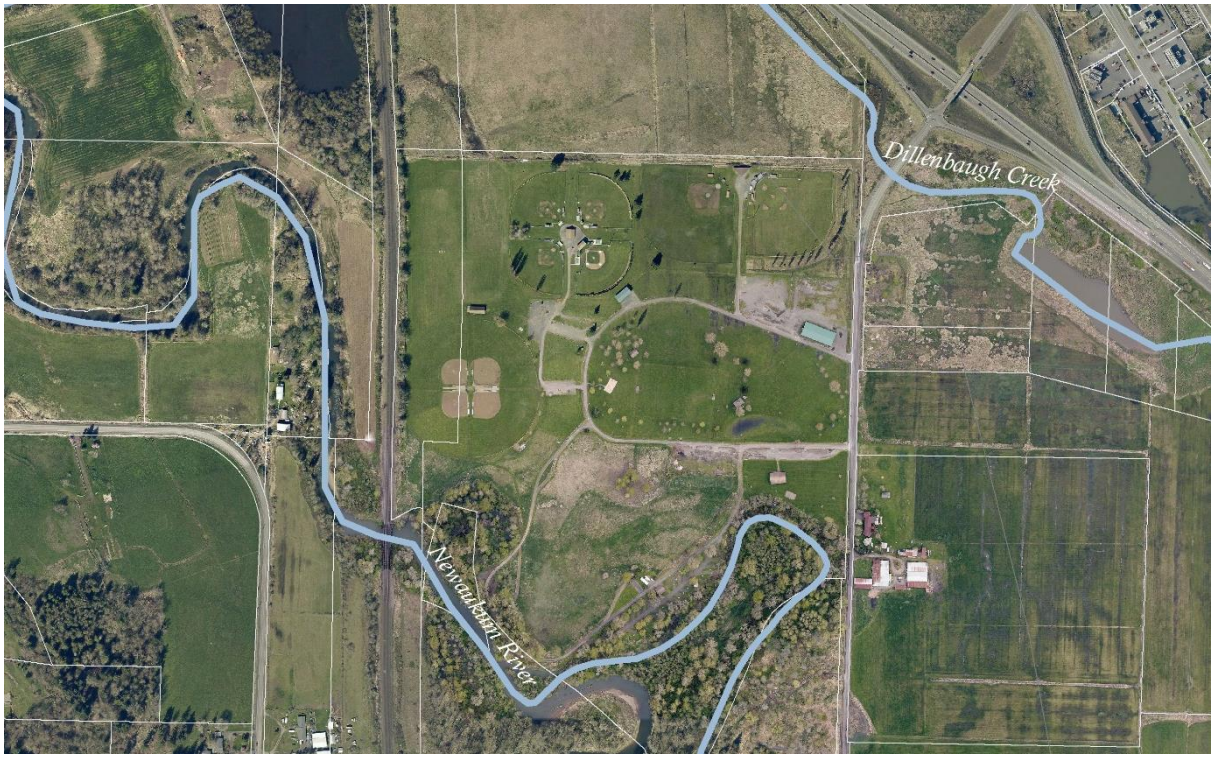
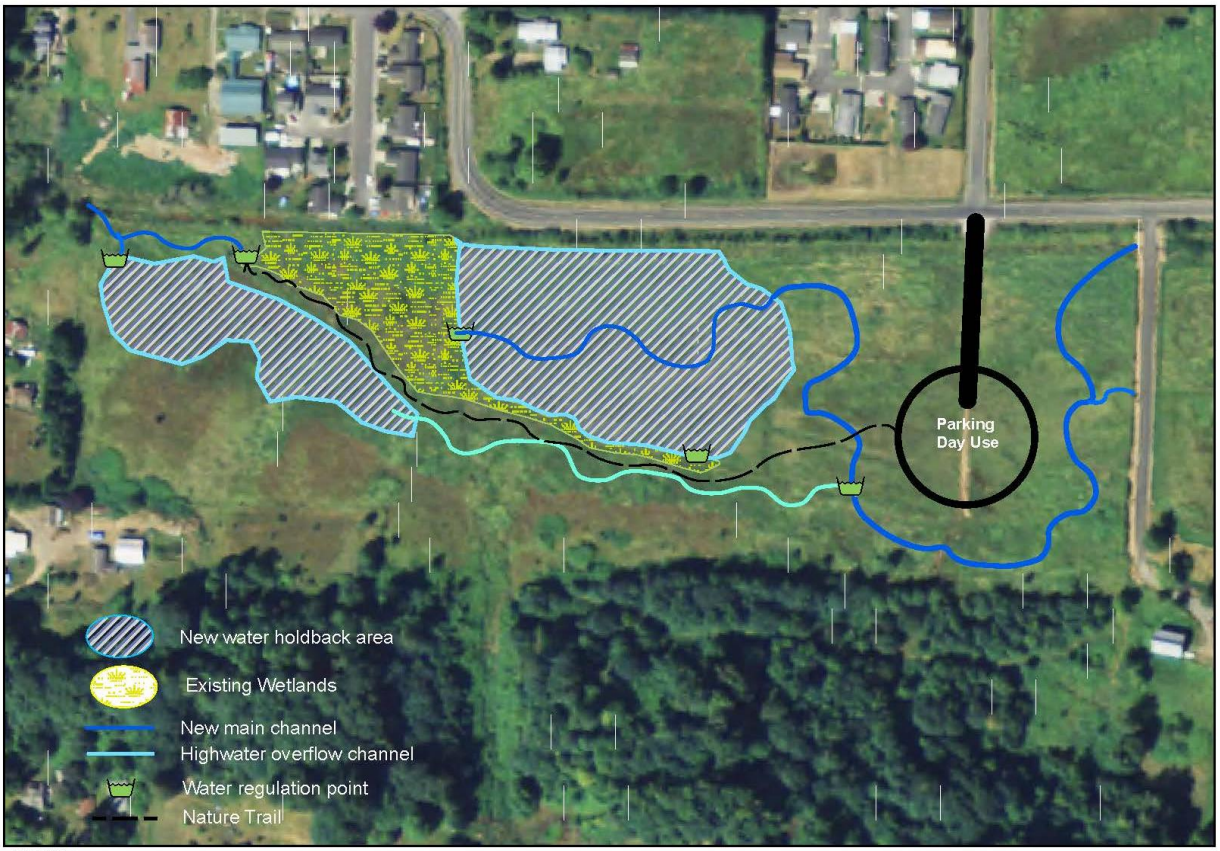
Table B-4	
Project Name	**Dillenbaugh Creek Restoration**
Location	City of Chehalis
	
Management Area	Upper Chehalis – Newaukum Management Unit
Project Source	Chehalis Basin Work Group. Scenario of Small Flood Damage Reduction Projects (2014), Habitat Work Schedule (2015). Project Sponsor – City of Chehalis.
Target Habitat	Riparian, juvenile salmonid rearing habitat
Current Ownership	City of Chehalis, Washington Department of Transportation
Project Focus	Stream relocation, restored channel structure and complexity, riparian habitat enhancement, flood hazard mitigation
Existing Conditions	Through much of its lower course, Dillenbaugh Creek runs in a ditched channel (overran with reed canarygrass) that travels parallel to Interstate 5. The creek crosses under I-5 three times before entering the Chehalis River north of State Route 6, and the many bridges for the undercrossings permit floodwaters to easily access downtown Chehalis.
Project Description	This project would excavate a meandering channel near the Rice Road undercrossing to divert Dillenbaugh Creek (through Stan Hedwall Park) to a confluence with the Newaukum River. The project would reduce the length of Dillenbaugh Creek by 1.93 miles, but would enhance the habitat for the creek as a whole (by connecting it with the Newaukum River). The new alignment would also help prevent flood damage in Chehalis by diverting flood flows across Stan Hedwall Park, rather than through I-5 and the southwestern portions of the community.

Table B-5	
Project Name	**China Creek Headwater Retention**
Location	**City of Centralia**



Management Area	Upper Chehalis, Newaukum Management Area
Project Source	Chehalis River Basin Flood Authority (City of Centralia). Project Sponsor – City of Centralia with the partnership of the Chehalis Tribe.
Project Focus	Flood control, stream restoration, public access
Current Ownership	Public
Strategy	Upstream wetland and stream restoration to promote water storage and limit peak flows associated with flood events.
Existing Conditions	China Creek regularly contributes to flooding in the City of Centralia. Ditching and removal of wetlands within the China Creek basin have contributed to the situation, increasing the peak flows during flood events.
Project Description	The City of Centralia purchased properties at the headwaters of China Creek in an attempt to reduce the downstream flooding. This project is intended to use excavated, naturally shaped landforms, stream channel friction and in-stream fish habitat features to slow and store runoff from the upper China Creek watershed during high flow runoff events. Restoration of a more natural creek hydrology and wetlands are anticipated to promote increased retention of floodwaters upstream and reduce the downstream flooding impacts in the City of Centralia.

Table B-6	
Project Name	**Salzer Creek Floodplain Storage and Riparian Restoration**
Location	**Unincorporated Lewis County, East of Centralia Urban Growth Area**

Management Area	Upper Chehalis, Newaukum Management Area
Project Source	Conceptual
Project Focus	Flood control, stream restoration
Current Ownership	Private
Strategy	Upstream wetland and stream restoration to promote water storage and limit peak flows associated with flood events.
Existing Conditions	Agricultural activities dominate the Salzer Creek valley. Mature riparian vegetation and natural stream sinuosity is lacking and flooding problems have been documented downstream.
Project Description	This project would recreate approximately 2,000 feet of a sinuous stream channel along Salzer Creek. New sections of creek would include large woody debris log clusters and be revegetated with native trees and shrubs, including wetland plants to help to provide flood storage during large storm events. Additional livestock fencing would be installed where necessary to protect the riparian plantings.

Table B-7	
Project Name	**Willapa Hills Trail Riparian Enhancement**
Location	**Unincorporated Lewis County, along Willapa Hills Trail Right-of-Way**

Management Area	Upper Chehalis, Lincoln and Upper Chehalis Management Areas
Project Source	Conceptual
Project Focus	Riparian Restoration
Current Ownership	Washington State Parks
Strategy	Partner with Washington State Parks to restore riparian habitat along the Willapa Hills Trail
Existing Conditions	Upper portions of the Chehalis River mainstem have several riparian areas with limited buffer widths or deficient riparian vegetation, due to the predominance of hardwoods within the canopy (Grays Harbor County 2011).
Project Description	This project would plant additional riparian vegetation along the Willapa Hills Trail in locations where the trail right-of-way is adjacent to the Chehalis River. The project would supplement the riparian habitat diversity and buffer widths within the upper reaches of the watershed, and assist in the recruitment of future large woody debris supplies.

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APPENDIX C – CHEHALIS BASIN CULVERT PRIORITIES BY SUBBASIN

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat* (Linear Miles of salmon habitat using DNR GIS Layer)	*Quality of Habitat* (% forested and % wetland habitat; area of spawning and rearing habitat if surveyed; Priority Index if calculated)	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream* (Site ID, Latitude, and Longitude)
021(15051)(03086)	1	43	Salzer Valley Rd	3.086	Salzer Creek	Unnamed Trib to Salzer Creek	67	14.05	76% Forest Cover, 17% Wetland	Coho, Cutthroat	Site ID: 1402W24A 46.68542, -122.87114
021(94006)(01315)	2	9	Rush Rd	1.315	Newaukum River (mainstem)	Allen Creek	33	14.13	33% Forested Cover, 33% Wetlands	Coho, Winter Steelhead, Cutthroat	-
1301W23D	3	19	Middle Fork Rd		Middle Fork Newaukum River	Middle Fork Newaukum River	0	15.08	78% Forest Cover, 25% Wetland	Coho (Spawning), Winter Steelhead, Cutthroat	Site ID:0980 46.595244, -122.75864
1402W28A	4	129	Symonds Rd	0.096	Salzer Creek	Coal Creek	0	8.73	86% Forest Cover, 12% Forest Cover	Coho (Spawning),Cutthroat	Site ID:1402W34B 46.65756, -122.91133 Site ID:0612 46.660869, -122.899299
1402W08A	5	63	Yew Street	0.23	China Creek	China Creek	33	14.99	77% Forest Cover, 24% Wetland	Coho (Spawning), Cutthroat	-
1403W12A	6	26	-	-	Scammon Creek	Scammon Creek	67	13.21	74% Forested Cover, 3% Wetlands, >771 sq. meters of spawning habitat,>18,868 sq. meters of rearing habitat	Coho, Cutthroat	Site ID: 1257 46.70923, -123.047753 Site ID: 1403W10B 46.71402, -123.04472 Site ID: 1403W10A 46.71524, -123.04198 Site ID: 1489 46.717097, -123.038413 Site ID: 1258 46.716342, -123.24532 Site ID: 1259 46.710403, -123.02698 Site ID: 021(91025)(01010) 46.70634, -122.99589

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
021(40028)(02366)	7	75	Newaukum Valley Rd	2.366	Newaukum River (mainstem)	Allen Creek	33	17.98	40% Forested Cover, 27% Wetlands	Coho, Winter Steelhead, Cutthroat	-
021(24034)(02386)	8	17	Bunker Cr Rd	2.386	Van Ornum Cr	Van Ornum Cr	33	6.45	90% Forested Cover, 2% Wetlands, 1574.91 sq. meters of spawning habitat, 11,471.76 sq. meters of rearing habitat, **Priority Index 18.47**	Coho, Cutthroat	Site ID: 4000650 46.668925, -123.098512 Site ID: 40005491 46.6691, -123.0875 Site ID: 40000651a 46.667644, -123.082299 Site ID: 1403W32B 46.65448, -123.09656
1302W29B	9	37	Holcomb Rd	0.818	Stearns Creek	Ripple Creek	33	8.01	73% Forested Cover, 64% Wetlands, > 1483.31 sq. meters of spawning habitat, > 3621.11 sq. meters of rearing habitat, **Priority Index > 13.4**	Coho, Winter Steelhead, Cutthroat	Site ID: 1302W31A 46.57651, -122.98232 Site ID: 1303W13A 46.60596, -123.00974
021(40046)(00032)	10	125	Borovec Rd	0.032	Dillenbaugh Creek	Berwick Creek	67	11.03	80% Forest Cover, 23% Wetland	Coho (Spawning), Cutthroat	Site ID: 021(040077)(01126) 46.630225, -122.875006 Site ID: 994286 46.619525, -122.92413 Site ID: 021(40044)(00815) 46.642112, -122.860745
021(40077)(00103)	11	156	Logan Hill Rd	0.0103	Dillenbaugh Creek	Berwick Creek	33	9.17	73% Forest Cover, 25% Wetland	Coho (Spawning), Cutthroat	Site ID: 021(040077)(01126) 46.630225, -122.875006 Site ID: 994286 46.619525, -122.92413 Site ID: 021(40044)(00815) 46.642112, -122.860745
1402W04D	12	-	Gold St	1.08	China Creek	China Creek	0	10.29	80% Forest Cover, 26% Wetland	Coho (Spawning), Cutthroat	-
021(10019)(13700)	13	22	Lincoln Cr Rd	13.7	Lincoln Creek	Wildcat Cr	67	4.89	86% Forested Cover, 2,418 sq. meters of spawning habitat, 9,310 sq. meters of rearing habitat, **Priority Index 15.87**	Coho (spawning), Cutthroat, Winter Steelhead (spawning)	-

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
1303W31A	14	221	-	-	Jones Creek	Unnamed Trib to McCormick Creek	33*	1.12	100% Forested Cover, 7% Wetlands, 824.37 sq. meters of spawning habitat, 2205.82 sq. meters of rearing habitat, **Priority Index 24.37**	Coho, Cutthroat	Site ID: 0320 46.577007, -123.345789
1501W27E	15	-	-	-	Hanaford Creek	Unnamed Trib to Hanaford Creek	67	6.5	45% Forested Cover, 25% Wetlands	Coho, Winter Steelhead, Cutthroat	Site ID: 1501W27B 46.75643, -122.79426
021(24034)(05678)	16	14	Bunker Cr Rd	5.678	Bunker Creek	Prairie Cr	33	4.75	84% Forested Cover, 3% Wetlands, 259.74 sq. meters of spawning habitat, 10,172.28 sq. meters of rearing habitat, **Priority Index 16.22**	Coho, Cutthroat	Site ID: 021(24034)(05319) 46.666491, -123.143189 Site ID: 1373 46.67031, -123.170844 Site ID: 1374 46.669702, -123.166207
021(14004)(00698)	17	61	Blanchard Rd	0.698	Scammon Creek	Scammon Creek	67	7.34	90% Forested Cover, 2% Wetlands, 669 sq. meters of spawning habitat, 5999 sq. meters of rearing habitat	Coho, Cutthroat	Site ID: 1257 46.70923, -123.047753 Site ID: 1403W10B 46.71402, -123.04472 Site ID: 1403W10A 46.71524, -123.04198 Site ID: 1489 46.717097, -123.038413 Site ID: 1258 46.716342, -123.24532 Site ID: 1259 46.710403, -123.02698 Site ID: 021(91025)(01010) 46.70634, -122.99589
021(92004)(08538)	18	44	Wildwood Rd	8.538	South Fork Chehalis	Bull Pen Cr	0	11.49	84% Forested Cover, 9 sq. meters of spawning habitat, 9,162 sq. meters of rearing habitat, **Priority Index 11.49**	Coho, Cutthroat	-

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
021(64022)(00529)	19	18	Pigeon Springs Rd	0.529	Middle South Fork Newaukum River	Frase Creek	0	6.54	97% Forest Cover	Coho (Spawning), Winter Steelhead (Spawning), Cutthroat	Site ID:0914 46.661973, -122.523762
021(25510)(00106)	20	68	Wendling Rd	0.106	Stillman Creek	Lost Cr	33	4.45	82% Forested Cover, 2% Wetlands, 690.3 sq. meters of spawning habitat, 5,522.19 sq. meters of rearing habitat, **Priority Index 11.68**	Coho, Winter Steelhead, Cutthroat	Site ID: 021(25570)(00024) 46.563712, -123.194962
1302W32B	21	327	-	-	Stearns Creek	Unnamed Trib to Stearns Creek	33	2.4	75% Forested Cover, 1537.35 sq. meters of spawning habitat, 6109.72 sq. meters of rearing habitat, **Priority Index 15.8**	Coho, Cutthroat	Site ID: 1302W31A 46.57651, -122.98232 Site ID: 1303W13A 46.60596, -123.00974 Site ID: 1139 46.545862, -122.981768 Site ID: 1140 46.552972, -122974254
1501W26C	22	-	-	-	Hanaford Creek	Snyder Creek	67	4.23	87% Forested Cover, 31% Wetlands	Coho, Winter Steelhead, Cutthroat	Site ID: 1501W27B 46.75643, -122.79426
021(30100)(02179)	23	193	Pleasant Valley Rd	2.179	Stearns Creek	Stearns Creek	67	2.4	75% Forested Cover, 1537.35 sq. meters of spawning habitat, 6109.72 sq. meters of rearing habitat, **Priority Index 15.8**	Coho, Cutthroat	Site ID: 1302W31A 46.57651, -122.98232 Site ID: 1303W13A 46.60596, -123.00974 Site ID: 1139 46.545862, -122.981768 Site ID: 1140 46.552972, -122974254
021(40106)(00558)	24	343	Deggler Rd	0.558	Lower South Fork Newaukum River	Unnamed Trib to Gheer Creek	67	5.48	66% Forest Cover, 30% Wetland	Coho, Cutthroat	-

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
Deggler Dam	25		Deggler Rd	0.918	Lower South Fork Newaukum River	Gheer Creek	0	4.41	88% Forest Cover, 30% Wetland	Coho, Cutthroat	-
021(92004)(05661)	26	69	Wildwood Rd	5.661	South Fork Chehalis	Cedar Creek	33	5.9	90% Forested Cover	Coho, Winter Steelhead (spawning)	Site ID: 4000E0156 46.451759, -123.079195 Site ID: 4000E0157 46.449363, -123.078232
1301E34A	27	242	Jorgensen Rd		Lower South Fork Newaukum River	Lost Creek	33	4.72	92% Forest Cover, 17% Wetland	Coho (Spawning), Cutthroat	-
1504W28A	28	200	-	-	Independence Creek	Unnamed Tributary to Independence Creek	67	1.65	85% Forested Cover, 327.71 sq. meters of spawning habitat, 2280.3 sq. meters of rearing habitat, **Priority Index 13.65**	Coho, Cutthroat	Site ID: 0624 46.772924, -123.18165 Site ID: 40001867 46.768588, -123.173222
021(10004)(01019)	29	69	Nelson Rd	1.019	Independence Creek	Unnamed Tributary to Independence Creek	33	1.85	95% Forested Cover, 1439.64 sq. meters of spawning habitat, 3508.94 rearing habitat, **Priority Index 13.74**	Coho, Cutthroat	Site ID: 40001991 46.755394, -123.195007 Site ID: 40001990 46.755547, -123.194716 Site ID: 40001989 46.756356, -123.194042 Site ID: 1504W21A 46.77515, -123.18918
021(10004)(00716)	30	337	Nelson Rd	0.716	Independence Creek	Unnamed Tributary to Independence Creek	0	2.1	77% Forested Cover, 2160.22 sq. meters of spawning habitat, 4299.26 sq. meters of rearing habitat, **Priority Index 10.97**	Coho, Cutthroat	Site ID: 40001991 46.755394, -123.195007 Site ID: 40001990 46.755547, -123.194716 Site ID: 40001989 46.756356, -123.194042 Site ID: 1504W21A 46.77515, -123.18918
021(40106)(00918)	31	322	Deggler Rd	0.918	Lower South Fork Newaukum River	Gheer Creek	33	4.41	88% Forest Cover, 30% Wetland	Coho, Cutthroat	-

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
021(24034)(08899)	32	104	Bunker Cr Rd	8.899	Bunker Creek	Unnamed Trib to Bunker Creek	33	1.86	26% Forested Cover, 12% Wetlands, 2569.7 sq. meters of rearing habitat, **Priority Index 12.89**	Coho	Site ID: 1404W15A 46.70108, -123.16587 Site ID: 021(24034)(05314) 46.666491, -123.143189
021(10004)(01168)	33	372	Nelson Rd	1.168	Independence Creek	Unnamed Tributary to Independence Creek	67	1.6	85% Forested Cover, 706.3 sq. meters of spawning habitat, 2886.88 sq. meters of rearing habitat, **Priority Index 9.92**	Coho, Cutthroat	Site ID: 40001991 46.755394, -123.195007 Site ID: 40001990 46.755547, -123.194716 Site ID: 40001989 46.756356, -123.194042 Site ID: 1504W21A 46.77515, -123.18918
021(15080)(00490)	34	234	Reinke Rd	0.49	Salzer Creek	Unnamed Trib to Salzer Creek	0	3.51	64% Forest Cover, 86% Wetland	Coho, Cutthroat	Site ID: 1402W24A 46.68542, -122.87114
021(25401)(01657)	35	88	Lost Valley Rd	1.657	Stillman Creek	Trib to Lost Cr	33	1.62	85% Forested Cover, 15% Wetlands, 58.1 sq. meters of spawning habitat, 2455.29 sq. meters of rearing habitat, **Priority Index 11.8**	Coho, Winter Steelhead, Cutthroat	-
150126A	36	54	-	-	Hanaford Creek	Snyder Creek	33*	3.53	100% Forested Cover, 35% Wetlands	Coho, Winter Steelhead, Cutthroat	Site ID: 1501W27B 46.75643, -122.79426
021(24019)(02040)	37	198	Pe Ell McDonald Rd	2.04	Jones Creek	Jones Creek	0	3.8	80% Forested Cover, 555 sq. meters of spawning habitat, 3272 sq. meters of rearing habitat, **Priority Index 3.64**	Coho, Cutthroat	Site ID: 021(24019)(22102) 46.56547, -123.25096 Site ID: 021(24019)(02900) 46.563445, -123.241362

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
021(46005)(04386)	38	194	Lucas Creek Rd	4.386	North Fork Newaukum	Unnamed Trib to Lucas Creek	33	2	90% Forest Cover, 2,103 sq. meters of spawning habitat, 2,081 sq. meters of rearing habitat, **Priority Index 9.89**	Coho, Winter Steelhead (spawning), Cutthroat	-
1402W24B	39	153	Reinke Rd	1	Salzer Creek	Unnamed Trib to Salzer Creek	33	2.18	80% Forest Cover, 3% Wetland	Coho, Cutthroat	Site ID: 1402W24A 46.68542, -122.87114
021(91009)(02925)	40	230	Garrard Creek Rd	2.925	Independence Creek	Unnamed Tributary to Independence Creek	33	1.1	100% Forested Cover, 1389.16 sq. meters of spawning habitat, 9732.8 sq. meters of rearing habitat **Priority Index 5.9**	Coho, Cutthroat	Site ID: 021(91009)(0204) 46.761786, -123.269301 Site ID: 1505W25A 46.76159, -123.25352 Site ID: 1504W30A 46.76243, -123.24532 Site ID: 2005 46.762544, -123.245373 Site ID: 1504W21A 46.77515, -123.181918
021(46005)(04239)	41	207	Lucas Creek Rd	4.239	North Fork Newaukum	Unnamed Trib to Lucas Creek	67	1.3	80% Forest Cover, 2,588 sq. meters of spawning habitat, 1,299 sq. meters of rearing habitat, **Priority Index 9.43**	Coho, Cutthroat	-
021(10004)(01536)	42	290	Nelson Rd	1.536	Independence Creek	Unnamed Tributary to Independence Creek	67	0.5	95% Forested Cover, 327.71 sq. meters of spawning habitat, 186.28 sq. meters of rearing habitat, **Priority Index 6.59**	Coho, Cutthroat	Site ID: 40001991 46.755394, -123.195007 Site ID: 40001990 46.755547, -123.194716 Site ID: 40001989 46.756356, -123.194042 Site ID: 1504W21A 46.77515, -123.18918
1501W27D	43	12	-	-	Hanaford Creek	Unnamed Trib to Hanaford Creek	33	1.38	2% Forested Cover, 35% Wetlands	Coho, Winter Steelhead, Cutthroat	Site ID: 1501W27B 46.75643, -122.79426 Site ID: 021(17901)(09233) 46.749554, -122.776594
1402W04C	44	-	Gold St	0.7	China Creek	Unnamed Trib to China Creek	0	3	65% Forest Cover, 22% Wetland	Coho, Cutthroat	-

Site ID	Lewis County Rank	*LCCD Rank **	*Road*	*MP*	*Basin*	*Stream*	*% Passable*	*Area of Habitat*	*Quality of Habitat*	*Potential Fish Present*	*Barrier Corrections Completed upstream and downstream*
021(15080)(01316)	45	390	Reinke Rd	1.316	Salzer Creek	Unnamed Trib to Salzer Creek	0	1.7	88% Forest Cover	Coho, Cutthroat	Site ID: 1402W24A 46.68542, -122.87114
1402W04E	46	-	Roswell Rd	0.105	China Creek	Unnamed Trib to China Creek	67	2.86	63% Forest, 23% Wetland	Coho, Cutthroat	-
1501W26B	47	-	-	-	Hanaford Creek	Unnamed Trib to Hanaford Creek	67	1.02	2% Forested Cover, 21% Wetlands	Coho, Winter Steelhead, Cutthroat	Site ID: 1501W27B 46.75643, -122.79426 Site ID: 021(17901)(09233) 46.749554, -122.776594

* Rankings were generated by the LCCD in 2003 based on field data collected between 2000 and 2003

APPENDIX D – POTENTIAL COWLITZ PROJECTS

Table D-1	
Project Name	**Otter Creek Side Channel Improvement**
Location	**Downstream of Otter Creek/Cowlitz River confluence, Lewis County**
	
Management Area	Lower Cowlitz
Project Source	Tetra Tech (2007). LCFRB (2015). Project Sponsor – Cowlitz Indian Tribe
Project Focus	Salmonid spawning and rearing habitat
Current Ownership	Cowlitz Indian Tribe
Strategy	Create a side-channel area and gravel supplementation bar to improve habitat for salmon.
Existing Conditions	The lower Cowlitz River provides spawning and rearing habitat for spring and fall chinook, Coho, winter and summer steelhead, and coastal cutthroat trout. Instream and riparian habitat has been simplified due to channel and levee construction, hydro-regulation of the river below Mayfield and Mossyrock Dams, reduced wood inputs from upstream sources, and shoreline development. The lack of habitat quantity and complexity limits juvenile salmonid rearing, especially for juvenile Coho, a species designated as a primary population by the Lower Columbia Salmon Recovery Subbasin Plan.
Project Description	This project would improve rearing and spawning habitat for salmonids near an existing side channel of the Cowlitz River (at river mile 42.5) below the confluence of Otter Creek and the Cowlitz River. The project would create a new 1,900 foot perennial side channel through Otter Creek Island, and a new 700 foot ephemeral side channel that connects to the existing Otter Creek side channel downstream. Several engineered log jams and a gravel augmentation bar would also be included within the project.

Table D-2

Project Name	**Cowlitz River Channel Migration Zone Easement**
Location	**Cowlitz River, West of Toledo, Lewis County**

Management Area	Lower Cowlitz
Project Source	Tetra Tech (2007), Conceptual
Current Ownership	Cowlitz Indian Tribe, Private
Project Focus	Side/off-channel spawning and rearing habitat
Strategy	Acquire easement to ensure continued channel migration
Existing Conditions	The lower Cowlitz River provides spawning and rearing habitat for spring and fall chinook, Coho, winter and summer steelhead, and coastal cutthroat trout. Instream and riparian habitat has been simplified due to channel and levee construction, hydro-regulation of the river below Mayfield and Mossyrock Dams, reduced wood inputs from upstream sources, and shoreline development. The lack of habitat quantity and complexity limits juvenile salmonid rearing, especially for juvenile Coho, which are designated as a primary population by the Lower Columbia Salmon Recovery Subbasin Plan.
Project Description	This project is intended to acquire an easement along the Cowlitz River to allow the channel to continue to migrate onto undeveloped lands and form side channels and other habitat features. The area has experienced significant recent channel migration and is currently providing high quality habitat. The project would permit the river to meander to a certain point and discourage landowners from armoring near the river banks. Portions of the site are owned by the Cowlitz Tribe.

Table D-3	
Project Name	**Lacamas Creek Side-Channel Re-Connection**
Location	**Lewis County**
Management Area	Lower Cowlitz
Project Source	LCFRB (2015). Project Sponsor – Lewis County Public Works.
Current Ownership	Private
Strategy	Restoration of side-channel habitat
Project Description	This project would recreate a side-channel for Lacamas Creek just south of Lewis and Clark State Park Historically, a side-channel carried flows through a sinuous side channel (1.82 miles in length) before reconnecting with the mainstem, but the channel was disconnected and straightened as part of a road project (in the early 1900s). The initial phase of the project would include the development of the 60 percent design for the reconnection of the side-channel, and a subsequent phase would carry the project through permitting, development of final plans, and the construction of the preferred alternative.

Table D-4	
Project Name	**Olequa Creek Riparian Restoration (With Area Students)**
Location	**City of Winlock**
Management Area	Lower Cowlitz
Project Source	Conceptual
Project Focus	Education, riparian habitat restoration
Current Ownership	Public, School District, Private
Strategy	Environmental education centered around stream health and riparian habitat enhancement
Existing Conditions	Olequa Creek as it travels through Winlock is Tier 1 priority for restoration by LCFRB. The creek currently has a small riparian buffer, steeply sloped and eroding banks, and shoreline modifications such as historic shoreline structural stabilization structures and a weir. The stream travels directly east of Winlock Elementary School.
Project Description	This project would involve students in the monitoring and ongoing restoration of Olequa Creek. Potential project components would include lessons devoted to learning stream ecology (and the importance of Olequa Creek given the dams upstream on the Cowlitz) and feature small-scale efforts to enhance the riparian habitat of the creek (such as planting riparian vegetation).

Table D-5	
Project Name	**Lower Yellowjacket Creek Restoration**
Location	**Yellowjacket Creek, Lewis County**
	
Management Area	Upper Cowlitz – Cispus
Project Source	LCFRB (2015). Project Sponsor – Cowlitz Indian Tribe, in partnership with the Gifford Pinchot National Forest.
Project Focus	Sediment reduction in lower Yellowjacket Creek, and the establishment of more stable channels.
Current Ownership	Federal
Strategy	Development of a comprehensive strategy to restore habitat within lower Yellowjacket Creek. Project would likely include the installation of large woody debris to help stabilize streambanks in the future.
Existing Conditions	Yellowjacket Creek is a large tributary to the Cispus River that supports a variety of salmonids, including spring Chinook, Coho, and steelhead. Rapid channel shifts and avulsions however have heavily impacted salmonid production. Several large floods, including a very large flood in 1996, altered the Yellowjacket Creek floodplain, resulting in large reductions in low-velocity rearing habitat, the isolation of floodplain terraces, rapid bank erosion, decreased riparian vegetation, and low channel stability.
Project Description	This project would produce an engineered design for lower Yellowjacket Creek that is characterized by stable, well vegetated islands within a network of channels that remain active throughout a range of creek flows. The project would also increase the overall amount of stable wood and wood volumes in the floodplain.

Table D-6	
Project Name	**Lower Cispus Side Channel Restoration**
Location	**Cispus River, Lewis County**
	
Management Area	Upper Cowlitz – Cispus
Project Source	LCFRB (2015). Project Sponsor – Cowlitz Indian Tribe, in partnership with Gifford Pinchot National Forest.
Project Focus	Enhancement of side channel habitat
Current Ownership	Federal
Existing Conditions	Historic disturbances within the Cispus subbasin have altered the natural sediment and hydrologic conditions of the watershed, resulting in degraded habitat conditions for salmonids. The cumulative impact of these disturbances has resulted in a simplified channel lacking instream complexity and cover (pools, instream wood), loss of floodplain connectivity and function, and a conversion from a branched channel to a meandering single thread channel (LCFRB 2015)
Project Description	This restoration project would re-create, restore, and connect off-channel habitat disconnected or destroyed over the past century. The Cowlitz Indian Tribe proposes to partner with Gifford Pinchot National Forest to create two off-channel salmonid rearing areas including, one channel (approximately 1,100 feet long) excavated into the floodplain terrace parallel to the North Fork Cispus River, and one existing channel (approximately 700 feet long) to be deepened parallel to Yellowjacket Creek near its confluence with the Cispus River. Each channel would be designed to intercept shallow groundwater and approximately 60 pieces of large woody debris would be placed in the new channels for cover structure and flow diversity for juvenile salmonid rearing.

Table D-7	
Project Name	**Cispus Yellowjacket Phase 1**
Location	**Yellowjacket Creek, Lewis County**
Management Area	Upper Cowlitz – Cispus
Project Source	LCFRB (2015). Project Sponsor – Cowlitz Indian Tribe, in partnership with the Gifford Pinchot National Forest.
Project Focus	Salmonid spawning and rearing habitat
Current Ownership	Federal
Strategy	Installation of large woody debris, and stabilization of three existing log jams and one in-stream structure
Existing Conditions	Historic disturbances within the Cispus and Yellowjacket valleys have altered the natural geomorphic and hydrologic conditions, resulting in degraded habitat conditions for salmonids. The cumulative impact of these disturbances has resulted in a simplified channel lacking instream complexity and cover (pools, instream wood) (LCFRB 2015)
Project Description	The Cowlitz Indian Tribe and the Gifford Pinchot National Forest propose to restore reaches in both the Cispus River and Yellowjacket Creek to restore habitat complexity along approximately two miles of high priority in-channel, side channel, and floodplain lands. To achieve this restoration, the project proposes to restore mid-channel islands by installing a variety of log complexes, restoring riparian plant development, and restoring an existing in-stream structure constructed nearly 15 years ago.

Table D-8

Project Name	**Silver Creek Habitat Restoration, Public Access**
Location	**Silver Creek, Lewis County**

Management Area	Upper Cowlitz
Project Source	Conceptual
Project Focus	Salmonid spawning and rearing habitat, improved public access
Current Ownership	State/ Federal/ Private
Strategy	Plant riparian vegetation, add large woody debris, add public access
Existing Conditions	Silver Creek is a tributary to the Upper Cowlitz that travels through the flat portion of Randle, after descending from the Gifford Pinchot National Forest. The creek as it travels through Randle is considered a Tier 1 habitat (by LCRFB) and was identified by Wade (2000) as encompassing a particularly limited habitat in the Upper Cowlitz basin – a low gradient tributary that provides spawning and rearing habitat.
Project Description	This project would add riparian vegetation (and potentially large woody debris) along Silver Creek north of US 12 to enhance the habitat and mimic more natural conditions along the stream. The project would additionally strive to include formalized public access to Silver Creek as part of the design (to create an amenity for the citizens of Randle). This public access could potentially connect to the Gifford Pinchot Forest land across Silverbrook Road and offer the opportunity for residents and visitors to explore both the creek and the upland areas that contribute to the waterbody.

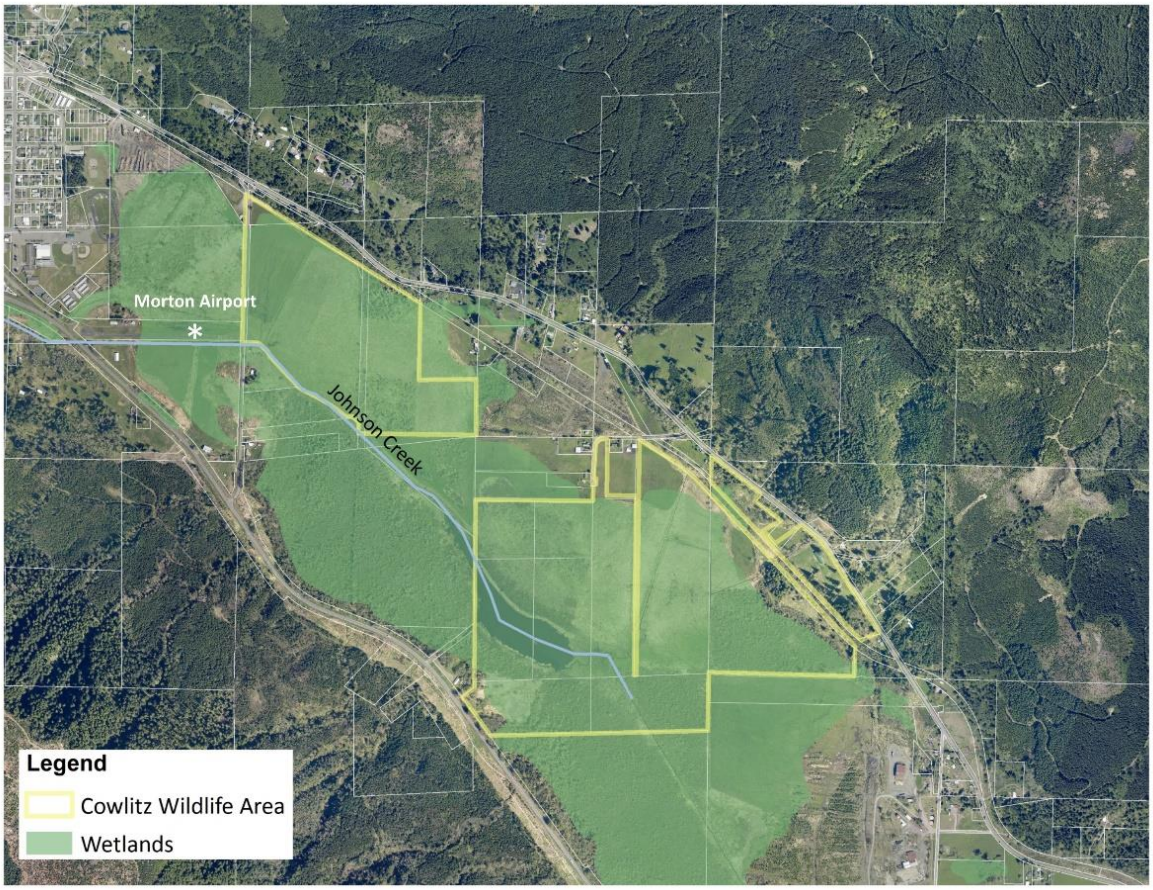
Table D-9

Project Name	**Morton Floodplain Wetland Connection**
Location	**Morton, Lewis County**

Management Area	Upper Cowlitz – Tilton
Project Source	Conceptual, based on Salmonid Habitat Limiting Factor Analysis. Water Resources Inventory Area 26 (Wade, 2000)
Project Focus	Restoration of associated wetlands, potential creation of lower velocity side-channel habitat
Current Ownership	Private
Strategy	Preservation and restoration of wetlands and floodplain along the Tilton River, and potential reconnection of the wetlands with the stream.
Existing Conditions	Within the Tilton subbasin, elevated peak flows and low summer flows appear to be an issue (Wade 2000). Limited low-velocity areas exist within the existing rivers and streams and during peak flow events “stream systems are often scoured of most spawning substrates, channels are altered, and juvenile attempting to rear in the system are flushed into Mayfield Reservoir” (p.154).
Project Description	This project would enhance the wetlands on the right bank of the Tilton in the Morton Urban Growth Area and potentially install a side channel to improve floodplain connectivity and create a stretch of slow moving habitat along the river. Together these efforts would open additional low velocity riverine habitat within the river system, and help to slow peak flows. A feasibility study would need to be performed to determine the viability of the project.

Table D-10

Project Name	**Davis Lake Flood Storage**
Location	**East of Morton, Lewis County**



Management Area	Upper Cowlitz – Tilton
Project Source	Conceptual
Project Focus	Flood mitigation, riparian habitat enhancement
Current Ownership	Tacoma Power (managed by Washington Department of Fish and Wildlife), Private
Strategy	Upstream wetland and stream restoration to promote water storage and limit peak flows associated with flood events.
Existing Conditions	Johnson/Lake Creek flows through a diked channel along the majority of its course from Davis Lake to beyond the Morton airport. Peak flows from the creek impact the Morton airport.
Project Description	This project would work with Tacoma Power and the Washington Department of Fish and Wildlife to determine the feasibility of enhancing Johnson Creek, Davis Lake, and the surrounding wetlands to better store water and limit peak flows along the Johnson/Lake Creek as it travels through Morton (similar to the Centralia project in Table B-6). A fundamental priority of the project would be to limit the flooding at the Morton Airport. A feasibility study would be necessary to determine the viability of the project.